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AS TO THE

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AND

COURSES OF INSTRUCTION

1887-1888

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Assistant Instructor.

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Assistant Instructor.

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HISTORICAL SKETCH

OF

COLUMBIA COLLEGE.

THE establishment of a college in the city of New York was many years in agitation before the design was carried into effect. At length, under an act of Assembly passed in December, 1746, and other similar acts which followed, moneys were raised by public lottery "for the encouragement of learning and towards the founding a college" within the colony. These moneys were, in November, 1751, vested in trustees; of these, ten in number, seven were members of the Church of England, and some of these seven were vestrymen also of Trinity Church.

These circumstances, together with the liberal grant of land to the college by Trinity Church, excited apprehensions of a design to introduce a church-establishment into the province, and caused violent opposition to the plan, as soon as it became known, of obtaining a royal charter for the college.

This opposition, however, being at last in a great measure surmounted, the trustees, in November, 1753, invited Dr. Samuel Johnson, of Connecticut, to be president of the intended college. Dr. Johnson consequently removed to New York in the month of April following, and in July, 1754, in a room of the school-house belonging to Trinity Church, commenced the instruction of a class of students; but he would not absolutely accept the presidency until after the passing of the charter. This took place on the 31st of October in the same year, 1754; and from this period the existence of the college is properly to be dated. The governors of the college, named in the charter, are the Archbishop of Canterbury, and the first Lord Commissioner for Trade and Plantations, both empowered to act by

proxies; the lieutenant-governor of the province, and several other public officers; also the rector of Trinity Church, the senior minister of the Reformed Protestant Dutch Church, the ministers of the German Lutheran Church, of the French Church, of the Presbyterian Congregation, and the president of the college, all *ex officio*, and twenty-four of the principal gentlemen of the city. The college was to be known by the name of *King's College*. Before the passing of the charter, a parcel of ground to the westward of Broadway, bounded by Barclay, Church, and Murray streets and the Hudson River, had been destined by the vestry of Trinity Church as a site for the college edifice; and, accordingly, after the charter was granted, on the 13th of May, 1755, a grant of the land was made. On a portion of this plot, at the foot of Upper Robinson street, as it was at first called, but afterwards Park Place, the college was built, and there stood for more than a century. The part of the land thus granted by Trinity Church, not occupied for college purposes, was leased, and became a very valuable endowment to the college.

The sources whence the funds of the institution were derived, besides the proceeds of the lotteries above mentioned, were the voluntary contributions of private individuals in this country, and sums obtained by agents that were sent to England and France. In May, 1760, the college buildings began to be occupied. In 1763 a grammar school was established. In March, 1763, Dr. Johnson resigned the presidency, and in his place the Rev. Dr. Myles Cooper, of Oxford, who had previously been appointed professor of moral philosophy and assistant to the president, was elected. In 1767, under the government of Sir Henry Moore, a grant of land was obtained, of twenty-four thousand acres, situated in the northern part of the province of New York; but by the terms of the treaty that the State of New York concluded with Vermont upon its erection into a separate State, this grant, with other grants of land lying in Vermont, was annulled, and the college consequently lost a tract of great value, upon which grew up the county town of the county in which it was situated.

In August, 1767, a medical school was established in the college.

The following account of the institution, supposed to be written by Dr. Cooper, shows its condition previously to the war of the Revolution:

“ Since the passing of the charter, the institution hath re-

ceived great emolument by grants from his most gracious majesty King George the Third, and by liberal contributions from many of the nobility and gentry in the parent country ; from the Society for the Propagation of the Gospel in Foreign Parts, and from several public-spirited gentlemen in America and elsewhere. By means of these and other benefactions, the Governors of the college have been enabled to extend their plan of education almost as diffusely as any college in Europe ; herein being taught by proper Masters and Professors, who are chosen by the Governors and President, Divinity, Natural Law, Physic, Logic, Ethics, Metaphysics, Mathematics, Natural Philosophy, Astronomy, Geography, History, Chronology, Rhetoric, Hebrew, Greek, Latin, Modern Languages, the Belles-Lettres, and whatever else of literature may tend to accomplish the pupils as scholars and gentlemen.

“To the college is also annexed a grammar school for the due preparation of those who propose to complete their education with the arts and sciences.

“All students but those in medicine are obliged to lodge and diet in the college, unless they are particularly exempted by the Governors or President ; and the edifice is surrounded by a high fence, which also encloses a large court and garden, and a porter constantly attends at the front gate, which is closed at ten o'clock each evening in summer, and nine in winter ; after which hours, the names of all that come in are delivered weekly to the President.

“The college is situated on a dry gravelly soil, about one hundred and fifty yards from the bank of the Hudson River, which it overlooks ; commanding, from the eminence on which it stands, a most extensive and beautiful prospect of the opposite shore and country of New Jersey, the city and island of New York, Long Island, Staten Island, New York bay and its islands, the Narrows, forming the mouth of the harbor, etc., etc. ; and being totally unencumbered by any adjacent buildings, and admitting the purest circulation of air from the river and every other quarter, has the benefit of as agreeable and healthy a situation as can possibly be conceived.

“Visitations by the Governors are quarterly ; at which times premiums of books, silver medals, etc., are adjudged to the most deserving.

“This seminary hath already produced a number of gentlemen who do great honor to their professions, the place of their education, and themselves, in divinity, law, medi-

cine, etc., etc., in this and various other colonies, both on the American continent and West India Islands; and the college is annually increasing as well in students as reputation."

In consequence of the dispute between this and the parent country, Dr. Cooper returned to England, and in his absence the Rev. Benjamin Moore was appointed *præses pro tempore*. Dr. Cooper, however, did not return.

On the breaking out of the Revolutionary War the business of the college was almost entirely broken up, and not until after the return of peace were its affairs again regularly administered.

In May, 1784, the college, upon its own application, was erected into a university; its corporate title was changed from King's College to Columbia College, and it was placed under the control of a board termed Regents of the University. New professors were appointed, and a grammar school and a medical department were established. Under this government the college continued until April, 1787; at that time the legislature of the State restored it to its original position under the present name of Columbia College. The original charter, with necessary alterations, was confirmed, and the college placed under twenty-nine trustees, who were to exercise their functions until their number should be reduced, by death, resignation, or removal from the State, to twenty-four, after which all vacancies in their board were to be filled by their own choice. At the same time a new body was created, called by the old name, "The Regents of the University," under which all the seminaries of learning mentioned in the act creating it were placed by the legislature. This body still exists under its original name.

In May, 1787, Dr. Wm. Samuel Johnson, son of the first president, was elected president of Columbia College. During the previous vacancy of the presidential chair, the professors had presided in turn, and in place of regular diplomas, certificates were given to graduates.

In the beginning of the year 1792, the medical school was placed upon a more efficient footing than before by the appointment of a dean of the faculty of medicine and seven medical professors.

In July, 1800, Dr. Johnson resigned the office of president. The Rev. Dr. Wharton succeeded him in the following year, but after about seven months resigned.

Bishop Moore succeeded Dr. Wharton. His ecclesiasti-

cal duties were such that he was not expected, except on particular occasions, to take an active part in the business of the college. The chief management of its concerns devolved upon the professors.

In 1809, the requisites for entrance into college, to take effect the following year, were very much raised, and a new course of study and system of discipline were established.

In 1810, a new amended charter was obtained from the legislature, by which certain restrictions in the former charter were removed, and some defects which experience had discovered were supplied.

In May, 1811, Bishop Moore resigned his office as president in order to make room for some person that might devote his whole time and attention to the college; and in June following, a new office, styled that of Provost, was created. The provost was, in the absence of the president, to supply his place, and also to conduct the classical studies of the senior class. Soon after this new arrangement the Rev. Wm. Harris was elected president and the Rev. John M. Mason provost.

In November, 1813, in consequence of the establishment of the College of Physicians and Surgeons in New York, the medical school of Columbia College was discontinued.

In 1816 the provost resigned his office, and since that time the college has been under the sole superintendence of the president.

In 1814, a grant was made to the college by the legislature, of a tract of land of about twenty acres on Manhattan Island, which had been occupied as a botanic garden by Dr. Hosack, and had been purchased of him by the State. The grant was accompanied by the condition that the college should be removed to the tract so granted within twelve years. In 1819 this condition was repealed. At that time the lands were valued at two hundred and fifty dollars an acre, or the whole at five thousand dollars. These lands, in the present map of the city, are embraced between the Fifth and Sixth avenues, and extend from Forty-seventh to Fifty-first street.

In September, 1817, steps were taken by the trustees for a thorough repair of the old edifice, which was in a very decayed state, and for the erection of additional buildings. Before the end of the year 1820, the proposed alterations and additions were completed.

At the close of the year 1827, the trustees resolved upon the establishment of a grammar school under the superin-

tendence of the faculty of the college ; this resolution was carried into effect early the following year ; and, in 1829, a building was erected upon the college ground for the accommodation of scholars. In 1864, the school was discontinued.

In October, 1829, Dr. Harris, the president of the college, died ; and in his room, on the 9th of December following, Wm. A. Duer, LL.D., was elected.

At the commencement of the year 1830, the system of instruction underwent very extensive additions and modifications, and the time of daily attendance upon the professors was materially increased. The course of study in existence at the time of making these additions was kept entire, and was denominated the full course. Another course of instruction was established, denominated the scientific and literary course ; and this was open to other than matriculated students, and to such extent as they might think proper to attend. In 1836, both courses of study were enlarged, the literary and scientific course, in particular, was defined and materially extended, and the sum of ten thousand dollars was appropriated for the purchase of additional apparatus, as well as for adding to the library the requisite books of reference and illustration.

The literary and scientific course, however, as distinguished from the full course, did not appear to find favor with the public, and in 1843 it was discontinued. At the time of its discontinuance there was not a single student engaged in it, and during the preceding two years there had been, in all, but four.

Among the important changes made on this same occasion was the adoption of the German language and literature as part of the sub-graduate course, and the establishment of the Gebhard professorship of German, upon the endowment made by the last will and testament of Frederick Gebhard. In January, 1847, the attendance of the two higher classes was made voluntary, and that arrangement continued in force until 1857, when the study of German was made wholly voluntary ; and four annual prizes, two of thirty dollars each, and the others of twenty dollars, were instituted. In 1880 the prizes were discontinued, and German was made an elective study.

On the 13th of April, 1837, was celebrated the semi-centennial anniversary of the reorganization of the college under trustees of its own.

In April, 1842, Wm. A. Duer, LL.D., resigned his office

of president, and in the following month of August, Nathaniel F. Moore, LL.D., was elected in his place. President Moore having resigned his office in 1849, Charles King, LL.D., was, in November of that year, chosen in his place.

In 1853, the order of Emeritus Professor was instituted, for the purpose of acknowledging appropriately the services of those professors who had devoted themselves to the college for twenty years or more. These gentlemen were to be without salaries or stated duties, but were to have certain designated privileges or honors.

The requirements of commerce rendered necessary the removal of the college from College Place; and in 1857 it was removed to the block that it now occupies, bounded by 49th and 50th streets, and by Fourth and Madison avenues.

On the removal of the college, the range of instruction was greatly enlarged, and several professors were added to the faculty.

In the autumn of 1858 a post-graduate course of instruction was opened; and in addition to lectures and instruction given by professors of the college, Professor Arnold Guyot delivered a course of lectures on comparative physical geography in its relation to history and modern civilization, and Mr. George P. Marsh a course upon the English language. But the time seemed not to be ripe for the proper support by the public of the scheme, and after one year's trial it was relinquished.

In May, 1858, a department of law, under the name of "The Law School of Columbia College," was established. There had been, at an early day, courses of law lectures delivered by a distinguished jurist and professor in the college, Chancellor Kent. These had attracted much attention, and had been of great service in fitting students to practise at the bar. Subsequently, in 1848, William Betts, LL.D., was made professor of law, and he delivered lectures, but these had for some years been wholly discontinued, and at the time referred to (1858) there was no systematic instruction in law given by any public institution in the city. The fundamental purpose of the existing organization was to give to students of law a more systematic and comprehensive course of instruction than was to be obtained by the ordinary methods of legal education that then prevailed. One of the chief ends in view was to impart to the study of jurisprudence a distinctively scientific character, and to inculcate a knowledge of legal principles by the constant drill

of oral recitation on the part of the students, and by familiar expositions given by thoroughly qualified instructors. In the adoption of this method of instruction by daily recitation, the custom, prevalent at that time and subsequently in similar institutions, of teaching by the mere reading of lectures to the students, was designedly much qualified, and this essential feature of the plan upon which the school was founded has, until within a comparatively recent time, constituted its distinguishing characteristic as compared with other law schools. The anticipated advantages to be derived from the system adopted have been attained in actual experience.

In 1860, by an arrangement with the regents of the university and the sanction of the legislature, a union was effected with the College of Physicians and Surgeons, by which that institution was adopted as the medical department of the college. The union is complete in the single respect that the united authority of the two institutions is necessary to the conferring of degrees, all the diplomas bearing the signature of the president of Columbia College with those of the faculty of medicine. The school has an independent board of trustees, and its financial affairs are entirely distinct from those of Columbia College.

In 1863, the necessary measures were commenced for organizing a department of science; and in the following year a School of Mines was established. Before the year 1864, there was no school in the United States in which mining was taught as a science. The young men of the country went abroad for their technical education in this department. In 1864, the Columbia College school was founded, with the distinctive purpose of furnishing to persons that desired it the means of acquiring a thorough scientific and practical knowledge of those branches of science which relate to mining, and of supplying to men engaged in mining and metallurgical operations persons competent to take charge of new or old works, and to conduct them on thoroughly scientific principles. Instruction is given in seven regular courses of scientific study, viz.: mining engineering, civil engineering, metallurgy, geology and palæontology, analytic and applied chemistry, architecture, and sanitary engineering.

In 1857, to the members of the senior class, choice was given among three courses of study, viz.: letters, jurisprudence, and science; but at the close of the academic year 1860-61 this option was withdrawn. In 1864 members of

the same class were allowed an option between classics and the higher mathematics; in 1872, and again in 1877, this option was extended. In 1880 the whole scheme of instruction was revised, and it was provided that, after the beginning of the junior year, all studies should be elective, with the additions and exceptions noted at the close of this sketch.

In 1851, Professor John McVickar, an alumnus of the college of the class of 1804, established, through the Society for Promoting Religion and Learning, two prizes, the first entitled "The Society's Greek Seminary Prize of Thirty Dollars," and the second, "The Society's English Seminary Prize of Twenty Dollars," to be annually competed for, under certain conditions, by those members of the graduating class that are candidates for admission to the General Theological Seminary of the Protestant Episcopal Church.

In 1858, the Association of the Alumni of the College instituted a prize of fifty dollars in money, or its equivalent, to be given to "the most faithful and deserving student of the graduating class."

In 1859, the trustees established in the law school four prizes for excellence of attainment in legal science, etc., of the values, respectively, of \$250, \$200, \$150, and \$100. In 1861, the scheme was modified, so that the prize of \$200 should be awarded thereafter for excellence in the department of political science.

In 1863, Dr. Wm. B. Moffat, an alumnus of the college of the class of 1838, bequeathed "\$2,000 for the purpose of one or more scholarships for the education of one or more students." This, by resolution of the board of trustees, constituted a foundation for two free scholarships, named the "Moffat Scholarships," the nomination to which belongs to the personal representatives of Dr. Moffat or their assigns.

In the year 1864, Dr. King resigned the presidency of the college, and the Rev. Frederick A. P. Barnard, S.T.D., LL.D., sometime Chancellor of the University of the Mississippi, was chosen to fill his place.

In 1868, two prizes in Greek, of the respective values of \$300 and \$150, to be competed for by members of the junior class, through examination in an entire play of *Æschylus*, *Sophocles*, or *Euripides* not read in the college course, were established by the trustees. In 1880 these prizes were discontinued.

In 1871, two fellowships in literature and science, open for competition, upon certain conditions, to the graduating

class, each of the annual value of \$500, to be held for three years, were instituted; and, at the same time, six scholarships in classics and mathematics were established in the freshman and sophomore classes, and the like number in the junior class, in latin, in logic and English literature, in history and rhetoric, in chemistry, in mechanics, and in physics. Subsequently this scheme was remodelled by dividing the scholarships between the sophomore and the freshman class, by adding in the latter class a scholarship in rhetoric, by transferring from the junior class to the sophomore the scholarship in chemistry, by adding in the junior class a scholarship in Greek, and by so rearranging the whole as to make fourteen instead of twelve, each of the annual value of \$100. In 1878 it was provided that the fellowships should be conferred annually by the trustees on the written recommendation of the faculty.

In 1873, two prizes in rhetoric and English composition, of \$100 and \$50 respectively, were established, to be competed for by written theses at the end of the senior year. In 1880 these prizes were discontinued.

In 1877, Mr. John Jones Schermerhorn, an alumnus of the college of the class of 1825, bequeathed \$5,000 to the college for the purpose of free scholarships, and on this foundation the trustees established five free scholarships, named the "Schermerhorn Scholarships," nomination to which is vested in the nearest male relative in each generation of the late Mr. Schermerhorn.

In the same year, Mr. John Winthrop Chanler, an alumnus of the college of the class of 1847, bequeathed \$1,000 to the college, the income of which was to be given annually to that member of the senior class who should be the author of the best essay in English prose on the history of civil government in America, or some other historical subject assigned by the faculty. This bequest became available to the college in 1879, and the first prize under it was awarded at commencement in 1880.

In 1874, a new building for the School of Mines was erected at a cost of \$150,000, and supplied with every convenience for the purposes of the school.

In 1879, a new building, with a frontage of two hundred feet on Madison Avenue and a depth of about sixty feet, was completed, at a cost of over \$200,000, for the School of Arts. The name "Hamilton Hall" has been officially given to this building.

In June, 1880, the trustees provided for the establish-

ment of a School of Political Science, the purpose of which is to give a complete general view of all the subjects both of internal and of external public polity from the three points of view—of history, law, and philosophy. The school was opened October 4, 1880, and is now in successful operation. In 1886, Jesse Seligman, Esq., of New York, established in the School of Political Science, for five years, four fellowships of the annual value of \$250 each, and Mr. E. R. A. Seligman, of the class of 1879, established, also for five years, an annual prize of \$150.

At the same time (1880) provision was made by which instruction is now offered in the college to graduates of this and other colleges in Greek, Latin, the pure mathematics, astronomy theoretical and practical, methods of research in physics, methods of research in chemistry, philosophy, history, political economy, English literature, the Anglo-Saxon language and literature, French literature, Spanish literature, Italian literature, German literature, the Sanskrit language and literature, and the Icelandic language and literature. And also, as soon as satisfactory arrangements can be made for the purpose, in the Hebrew language and literature, natural theology and the evidences of Christianity, comparative philology, natural history in its several branches, and the principles of the common law. The lecture courses of the School of Mines in certain subjects were likewise opened to graduate students, embracing general theoretic and applied chemistry, botany, zoölogy, geology, palæontology, mineralogy, and crystallography. The Graduate Department is now in successful operation.

The trustees further provided that "two hours per week during the freshman and sophomore years be hereafter devoted to French, German, Italian, Spanish, Danish, or Swedish at the option of the student"; that in the junior year all the regular exercises in history, the English language and literature, and Anglo-Saxon, and in the senior year the same with the exception of history, should be obligatory upon all the students; and all the other studies, to which were added German, French, Spanish, Italian, Danish, Swedish, and Icelandic, should be elective; and finally, that students should receive, on the satisfactory completion of their course, "the degree of bachelor of letters, bachelor of science, or bachelor of arts, according to the character of the studies chiefly pursued by them."

In 1885, this plan was modified by restricting the choice as to modern languages, in the freshman and sophomore

years, to German and French, with the proviso that the one chosen should be pursued till the end of junior year; by making obligatory, during junior year, ten hours per week in Greek, Latin, English, history and political economy, logic and psychology, other studies being elective; and by making all the studies of the senior year elective.

In June, 1883, the trustees provided that a course of collegiate study, equivalent to the course given to young men in the college, should be offered to such women as may desire to avail themselves of it, to be pursued under the general direction of the faculty of the college; admission to such course to be by a strict preliminary examination; each student admitted to be entirely free as to where and how she shall pursue her studies, to be examined in writing at stated times by officers of the college or their representatives, and to be entitled, at the end of her fourth year, or on the completion of any of the prescribed courses, to receive a certificate stating the subjects that she has pursued, and with what success. In February, 1887, the plan was modified by authorizing the conferring of the degree of bachelor of arts upon students who have satisfactorily completed a full course, equivalent to that for which the degree is bestowed upon young men, and by giving permission to women graduates of this college, and of other colleges in good repute, to study for higher degrees under the direction of the faculty.

In 1883 was completed, at a cost of over \$400,000, a fire-proof building for the library, for the accommodation of the School of Law, and for an astronomical observatory.

On the completion of the library hall, the several libraries of the college were consolidated into one collection, and a chief librarian, with five librarians of departments and fifteen assistants, was appointed to put the whole into working condition. The library is open from 8 A. M. to 10 P. M., every day in the year except Sundays and Good-Friday. In 1881, Stephen Whitney Phoenix, of the class of 1859, bequeathed to the college his private library, a choice collection of about seven thousand volumes, in fine condition, embracing many very valuable and some very rare works. In 1885, J. F. Loubat, Esq., of New York, presented to the library books and plates which cost over \$20,000; and in 1886, A. A. Low, Esq., of Brooklyn, N. Y., presented \$5,000 for the purchase of books.

A School of Library Economy, for the training of librarians and cataloguers, was opened in January, 1887. Its

aim is entirely practical: to give the best obtainable advice, with specific suggestions on each of the numerous questions that arise from the time a library is decided to be desirable until it is in perfect working order, including its administration.

Early in 1884, Lewis M. Rutherfurd, Esq., of New York, presented to the college an equatorial refracting telescope of thirteen inches aperture, supplied with a correcting lens for photographic work, to which belong two micrometers for position measurements; a transit instrument of three inches aperture by Stackpole & Brother; a Dent sidereal clock; a micrometer for measuring photographic plates; and sundry other pieces of apparatus—the whole increasing the value of the instruments in the observatory by about \$20,000.

In June, 1885, Professor John Tyndall, of London, presented to the college \$10,800, to be used as a fund for the encouragement of scientific research. With this fund the trustees established the John Tyndall Fellowship for the encouragement of research in physics.

On Wednesday, the 13th of April, 1887, was commemorated the one hundredth anniversary of the revival and confirmation, by the legislature of the State of New York, of the royal charter granted in 1754. In the morning, at the Metropolitan Opera House, Frederic R. Coudert, Esq., of the class of 1850, delivered an oration, and the Rev. Dr. George Lansing Taylor, of the class of 1861, read a poem, before a large audience; and honorary degrees were conferred upon a number of distinguished persons, three of whom were women. In the evening the college buildings were illuminated and thrown open for the reception and entertainment, by the president and faculty, of a great body of alumni and other invited guests.

Columbia College has, at the present time, a School of Arts, a School of Mines, a School of Law, a School of Political Science, a School of Library Economy, and a School of Medicine, employing a president and one hundred and eighty professors, instructors, and assistants, and has in all the departments fifteen hundred and seventy students.

COLUMBIA COLLEGE, May, 1887.

COLUMBIA COLLEGE



SCHOOL OF ARTS

ADMISSION, FEES, ETC.

ADMISSION.

1. As a general rule, no student will be admitted to the freshman class at its formation, unless he shall have attained the age of fifteen years ; nor will any one be admitted to a more advanced standing without a corresponding increase of age.

2. Applicants for admission to the freshman class are examined in the English, Latin, and Greek grammars ; in Greek and Latin prosody, and in Greek, Latin, and English * composition ; in ancient geography ; in modern geography (Appleton's Higher Geography or equivalent) ; in ancient history (Rawlinson's Manual of Ancient History or equivalent), in arithmetic, including the metric system of weights and measures ; in algebra, on the first five chapters of Peck's Manual of Algebra ; in geometry, on the first four books of Davies' Legendre ; and in the following books, or their equivalents, in the Latin and Greek languages, viz., five books of Cæsar's Commentaries on the Gallic War ; the Eclogues (entire) and the first six books of Virgil's Æneid ; six orations of Cicero ; four books of Xenophon's Anabasis ; and three books of Homer's Iliad.

An applicant may, at the appointed entrance examinations of one year, be examined in portions of the above subjects that are *complete* in themselves—*e. g.*, the Anabasis or the Iliad ; Cæsar, Virgil, or Cicero ; arithmetic, algebra, or geometry ; etc.—and finish his examination in the requirements for admission at the entrance examinations of the year following.

3. Candidates for advanced standing are examined on the studies which have been previously pursued by the classes

* NOTE.—The English composition is to be written in the room at the time of examination, on a subject given out by the examiner, and to be at least one foolscap page in length.

which they propose to enter, as well as upon those which have been enumerated in the foregoing section.

All candidates for admission must be examined. Certificates are not received in lieu of examination.

4. Every candidate for admission must, before examination, present a certificate of good moral character from his last teacher, or from some citizen in good standing, and students from other colleges must bring certificates from those colleges of honorable dismissal.

5. Applications for admission are received, and candidates are examined on Monday and the days following of the week next preceding the annual commencement in June; on Monday and the days following of the week next preceding the opening of the first session in October; and at any time during the term; but not during the vacation.

6. Applicants who desire special examination for entrance into an advanced class or department must give a month's notice to the professors who are to conduct such examination, and must arrange with them the day, the hour, and the exact subject of such examination.

7. Every candidate admitted into the freshman class and every student must, at the commencement of the scholastic year, write down for record his own name in full and his city address, if any, and the name and place of abode of his father or guardian.

8. None but matriculated students or graduates of the college are allowed to attend any of the classes without the special permission of the Board of Trustees.

9. Attendance on scholastic exercises (except in the case of free students) is not allowed until the tuition fee has been paid.

NON-RESIDENT CANDIDATES FOR A DEGREE.

Teachers and others engaged in indispensable occupations which interfere with class hours may become candidates for the degree of bachelor of arts without being held to attendance on class exercises, under the following conditions, to wit:

1. Every such candidate must fully satisfy the requisitions prescribed for entrance to college, and must matriculate as a member of the class which he is found qualified to enter.

2. He must show evidence that the occupation in which he is engaged is one which he cannot relinquish without serious disadvantage.

3. He must pay the usual tuition fee.

4. He must present himself for examination with his class at the semi-annual examinations, and at such other times as may be appointed by the faculty.

Such candidates are entitled to receive from members of the faculty such advice and assistance as may be necessary to guide them in their studies.

SPECIAL STUDENTS.

Special students are received in any year, and permitted to select such courses as they may choose and may be found qualified to enter upon, but are not considered candidates for the degree of A.B.

FEES AND NECESSARY EXPENSES.

1. Each student must pay a fee of five dollars before matriculation in each year, and such fee must be paid by the applicant for admission before examination; and in case the examination is held at a time not appointed in previous public announcements, the fee required is ten dollars.

2. In the case of an applicant who completes his examination for admission at the appointed entrance examinations of two successive years, but one fee of five dollars is required.

3. The annual tuition fee of each student is one hundred and fifty dollars, to be paid one half at the commencement of each session.

4. Every candidate for the degree of bachelor of arts, bachelor of letters, or bachelor of science must pay a fee of fifteen dollars before being admitted to the final examination of the course, and every candidate for the degree of master of arts, master of letters, or master of science must pay a fee of twenty-five dollars before being admitted to examination for such degree.

5. Every student who may be admitted to an extra examination, in anticipation of the time regularly appointed, or in consequence of failure to attend or to perform satisfactorily at any intermediate or concluding annual examination throughout the course, must pay a fee of five dollars before being admitted to such examination.

6. The necessary expenses of a student are:

Board, from six and a half to ten dollars per week.

Matriculation fee, \$5.

Annual tuition fee, \$150.

Text-books, from \$8 to \$15 each year.

Fee for final examination for degree, \$15.

The total *necessary* expenses of a student per week for the scholastic year averages about \$13.

FREE TUITION.

It is the desire of the trustees to extend, as widely as possible, the educational advantages of the college to deserving young men. Free tuition is therefore offered to such, under the conditions specified below :

1. At the time of his entrance examination the applicant must inform the examiners that he desires to be admitted to free tuition, in order that they may make special report as to the merit of his performance.

2. He must present a certificate signed by some person of good repute, stating that the writer is acquainted with the circumstances of the applicant (his parents or guardian if he has such), and knows him (or them) to be unable to bear the expense of his education if obliged to pay the tuition fee ; also that he (the writer) is not himself a relative of the applicant. The necessary blank forms may be obtained of the registrar.

3. He must exhibit a proficiency in every subject of examination expressed by the number 6 of a scale in which 10 is the maximum.

4. He must maintain, subsequent to his admission, a standing in scholarship in each department of study, expressed by the number 7 of a scale in which 10 is the maximum, or an average standing in all departments expressed by the number 8, of a similar scale, failing which he will forfeit his privilege.

Free students are not exempt from the payment of fees for matriculation in each year, for extra examinations, and for graduation.

FREE SCHOLARSHIPS.

1. By the will of Dr. W. B. Moffat, of the class of 1838, the sum of \$2,000 was, in 1863, bequeathed to the college, on which was founded two free scholarships, called the "Moffat Scholarships," the right of nomination to which belongs to the personal representatives of Dr. Moffat or their assigns.

2. In 1877 a bequest, amounting to \$5,000, from the estate of Mr. J. J. Schermerhorn, of the class of 1825, became available to the college, upon which were established five free scholarships, called the "Schermerhorn Scholarships," the right of nomination to which is vested in the nearest male relative of the founder, in each generation, during his life.

3. By enactment of the Board of Trustees, the Association of the Alumni of Columbia College is entitled to have always four students, and the Society for Promoting Religion and Learning is entitled to have always two students in each class, instructed free of charge. Candidates for admission and students upon these scholarships are subject to conditions 3 and 4, noted above, in regard to free tuition.

FOUNDATIONS.

1. Any person or persons who may found a scholarship to the amount of two thousand dollars shall be entitled to have always one student educated in the college free of all charges for tuition. This right may be transferred to others. The scholarship shall bear such name as the founder or founders may designate.

2. Any religious denomination, or any person or persons, who shall endow a professorship in the classics, in political, mathematical, or physical sciences, or in the literature of any of the ancient or modern languages, by the payment of not less than one hundred thousand dollars to the treasurer of the college, shall forever have the right of nominating a professor for the same (subject to the approbation of the Board of Trustees), who shall hold his office by the same tenure as the other professors of the college; the nomination to be made by the authorized representatives of the religious community or by the person or persons who shall make the endowment, or such person or persons as he or they may designate. The proceeds of the endowment will be appropriated to the salary of the professor.

EXAMINATIONS.

There are held two examinations of all the classes every year, one commencing on the last Monday in January, and the other on the Monday of the third week preceding commencement. The latter is called the concluding examina-

tion of the scholastic year; the former, the intermediate examination. These examinations are open to the public.

In addition to the public examinations, private examinations are held monthly in all the classes, and in every department, for the purpose of ascertaining the proficiency of the students in their respective studies.

PUBLIC WORSHIP.

Prayers are attended in the college chapel every morning, with the reading of the Scriptures and singing, and all the students residing on Manhattan Island are required to be present.

SCHOLASTIC TERMS.

The first term of the regular course of study commences on the first Monday in October.

The second term commences on the Thursday next after the intermediate examination in February.

COMMENCEMENT AND VACATION.

The annual commencement is held on the second Wednesday in June, on which occasion degrees are publicly conferred.

A vacation of all the classes follows the day of commencement, extending to the first Monday in October, on which latter day the regular course of study recommences.

All scholastic exercises are suspended on Ash-Wednesday, on Good-Friday, on Easter Monday, on public holidays established by law, on such days in each year as may be recommended by the civil authority to be observed as days of fast or thanksgiving, and for two weeks from the third (or fourth) Monday in December.

EXTRACTS FROM THE REGULATIONS.

ENTRANCE CONDITIONS.

1. Students admitted conditionally must satisfy all conditions within two months of the date of their admission, unless the time be extended by vote of the faculty.

2. Students who fail to satisfy their entrance conditions within the time specified will be dropped from the roll.

GENERAL REGULATIONS.

1. During the hours set apart for college exercises students must not linger about the grounds, the passages, or the vacant rooms.

2. On the college premises, the throwing of missiles of any kind, except such as are used in games of recreation permitted by the president, is prohibited.

3. At the ringing of the bell for morning prayers every student will promptly repair to his seat in the chapel, and remain there until the close of the chapel services.

4. Immediately after prayers the students of the several classes or sections will proceed directly to their respective class or section rooms, where they will remain until the close of the hour allotted to the exercises.

5. At the end of each hour the classes and sections will be dismissed. Between successive hours of attendance there will be an interval of five minutes, at the end of which the students will promptly repair to the rooms where their attendance is due.

6. The use of tobacco in any form in the college buildings is not allowed.

7. No student may leave a class-room during the progress of any scholastic exercise.

8. Excuses for absence from college exercises will not be required or received.

9. Any student who shall absent himself from any one of his regular exercises while he is on the college premises, or shall leave said premises during the hours at which his attendance is due, shall be liable to removal from the roll of his class.

10. Any student whose absences, during any session, in any department, shall exceed one fourth of the total number of exercises in that department for the same session, will be debarred from the ensuing semi-annual examination in that department, and will cease to be a candidate for a degree.

11. In case a student is absent for more than one fourth of the time on account of illness or other causes beyond his control, he may be relieved of the operation of the foregoing provision by act of the faculty. Every such case must be considered on its own merits.

12. Every student absent from any monthly examination shall be marked zero therefor—unless his absence was occasioned by illness or other unavoidable cause properly attested

to the faculty, in which case he shall be held to examination within the month following his return.

13. Any student who shall be found deficient in the same department in more than one monthly record, may be required to study with a private tutor the subjects in which he is deficient, and to pass a rigorous examination on the same, at a time to be appointed by the faculty, or he shall no longer be permitted to be a candidate for a degree.

14. Every student absent from either of the semi-annual examinations shall be marked zero therefor—unless his absence was occasioned by illness or other unavoidable cause properly attested to the faculty, in which case he shall be held to examination within the week after his return to college, unless the time be extended by vote of the faculty.

15. At the opening of the college in October, no student who shall have failed to make good all deficiencies in the term examinations of the preceding year shall be allowed to proceed with his class, except by special vote of the faculty.

Should a student, allowed to proceed with his class by special vote, fail to make good his term deficiencies within the time specified in the vote of the faculty as above, he will be dropped from the roll of his class.

16. Any student who shall have passed a satisfactory examination in the School of Mines of Columbia College, in any study forming a part of the regular course in the School of Arts, will not be required to pursue that study in the School of Arts.

17. A student admitted to advanced standing shall have a mark assigned him, in the several departments, based upon examination at the time of his entrance.

18. A student absent on leave, for a term or longer, shall on his return have a mark assigned him based upon his performances when present.

19. A delinquent student, examined in any subject and reported "passed," shall receive a minimum mark in that subject.

20. Any student, who repeats a year of the college course, may be allowed to omit any study in which he obtained, in the previous year, a mark of 80 per cent. or over.

21. No student shall be a member of any professional school during his academic course.

CHAPEL REGULATIONS.

1. The bell for morning prayer will begin to ring at 9:40 o'clock, and will ring for two minutes, during which time the students will repair to their seats in the chapel. The chapel door will then be closed, and will not be opened again until after the reading of the lesson. The door will then be opened for the admission of such as may be tardy, and will then again be closed, and will remain closed until the end of the services. After the services the freshman class, with the officers who instruct them, will first leave the chapel; the other classes, with their instructors, will follow in order, as they may be dismissed by the president.

2. The several classes will be separately seated in the chapel, and will preserve throughout the year the seats assigned them.

3. Conversation in the chapel is prohibited.

4. During prayer and singing, students will rise and remain standing in their places without turning round.

5. An officer of the roll will be appointed by the president from among the students in each class, whose duty it shall be to keep the record of attendance. Every such officer will have a seat from which he may observe the members of his class, and will make his record silently. He will deliver his report to the president before leaving the chapel.

6. No student may carry into the chapel books, papers, canes, umbrellas, or other articles unsuited to the place.

7. Should a student arrive on the college grounds after the beginning of the exercises, but in time to enter after the reading of the lesson, he will attend at that time. Should he arrive after the second closing of the door, and before the close of the services, he will repair to the cloak-room, and remain there until the services are over.

8. If any student shall absent himself from more than one fourth of the required chapel exercises during one term, he shall cease to be a candidate for a degree.

RULES OF EXAMINATION.

1. Students shall be seated as directed by the examining officer.

2. No book or paper shall be brought to the examination room.

3. No student shall hold any communication with another while under examination.

When the examination is conducted in writing:

4. Each student must write his papers in a fair and legible hand, and sign his name thereto.

5. The exercises shall be written on papers prepared for the purpose, which shall not be detached from each other by the student.

6. No student shall leave the room till the completion of his exercise.

7. Any student who shall fail to attend *punctually* at the hour appointed for examination in any department, at either of the regular semi-annual examinations, without satisfactory reason therefor, shall not be entitled to an examination, but shall be marked zero.

8. Each student is permitted to retire when he has completed his paper. Before leaving the room he must make such disposition of his paper as the presiding officer may direct.

9. Writing may continue for three hours and no longer.

ELECTIVE STUDIES.

1. Members of the freshman and sophomore classes must choose German or French, instruction in each of which is given two hours per week throughout the year.

2. For special reasons, and on the recommendation of the professor of modern languages, a student may be permitted by the faculty to choose, in place of German or French, some other modern language. A student, having made his election as to German or French, is held to the same till the close of the junior year.

3. The required studies of the junior class in Greek, Latin, English, history and political economy, logic and psychology, occupy ten hours per week throughout the year. Other subjects of study are elective, subject to the provision that the studies selected by a student shall suffice, with the obligatory studies, to occupy at least fifteen hours per week.

4. All the studies of the senior class are elective, subject to the provision that the studies selected by a student shall occupy at least fifteen hours per week.

5. Students who have made their choice of elective studies to be pursued during the year, shall not be permitted to abandon any study so selected in favor of another, without the permission of the faculty.

MAXIMA AND DETERMINATION OF STANDING.

1. In case a student shall elect studies which, with the obligatory studies, occupy more than the number of hours per week required by law, he shall determine, at the time of making such election, upon which of the elective studies with the obligatory ones his standing in scholarship shall be made.

2. In any department the monthly maximum for each class shall be ten; and the minimum shall be five for the freshman and sophomore classes, and six for the junior and senior classes.

Any student shall be accounted deficient for the month in any department in a monthly record of which he is assigned a mark less than the prescribed minimum.

3. Each semi-annual examination shall have a weight in the determination of standing in scholarship equal to that of all the monthly examinations of the preceding half year.

In any department the term (or semi-annual) maximum for each class shall be obtained by multiplying 160 by the number of times per week the class has attended in that department during the preceding half year; and the minimum shall be 50 per cent. of the maximum for the freshman and sophomore classes, and 60 per cent. of the maximum for the junior and senior classes.

Any student shall be accounted deficient for the term in any department in a semi-annual report of which he is assigned a mark less than the prescribed minimum.

4. The sum total of all the valuations assigned to the performances of each student in any department in the semi-annual reports, shall be taken to express the value of the student's scholarship in that department.

5. At the close of the senior year the results contained in all the semi-annual reports of all the four years shall be combined, by adding together the valuations assigned to the performances of each student severally in such reports. On the basis of the totals thus ascertained the members of the graduating class shall be arranged in four classes, the first three of which shall be designated, respectively, the first, second, and third classes of honor. The classes of honor shall be arranged as follows:

First class—Those having a total mark of 95–100 per cent. of the total maximum for the four years.

Second class—Those having a total mark of 90–95 per cent. of the total maximum.

Third class—Those having a total mark of 80–90 per cent. of the total maximum.

PRIZES AND PRIZE SCHOLARSHIPS.

1. For the prize of the Association of the Alumni "to the most faithful and deserving student of the graduating class," three names are to be selected by the faculty and submitted to the class, who, from these three, are to designate one to receive the prize.

Should the class at any time fail to make the selection, and give notice thereof to the president of the college, at least ten days prior to the day appointed for the commencement, the faculty may select the student to receive the prize.

2. For the Chanler historical prize to the member of the senior class who shall be the author of the best original manuscript essay in English prose on the history of civil government in America, or some other historical subject assigned by the faculty, the subject will be announced on or before November first, and the competing essays must be delivered to the president on or before May first in each year.

3. "The Society's Greek Seminary Prize of Thirty Dollars," and "The Society's English Seminary Prize of Twenty Dollars," founded by the late Professor John McVickar, through the Society for Promoting Religion and Learning, are open for competition to such members of the graduating class as shall have given their names to the president, at least one month prior to the time of competition as candidates for the General Theological Seminary of the Protestant Episcopal Church.

4. The books or subjects on which examinations will be held for the several prize scholarships offered by the trustees for competition to the members of the freshman, sophomore, and junior classes, respectively, will be announced on or before November first in each year.

5. No competitor shall be entitled to a prize scholarship, unless he shall receive, in the examination for the same, a mark above 90 in a scale of which 100 is the maximum; nor shall he be entitled to honorable mention unless he shall receive in the examination a mark of 90 or more in a like scale.

6. Competitors for prizes and prize scholarships must be of good and regular standing in their respective classes, in all departments.

7. The names of the successful competitors for the several

prize scholarships and prizes shall not be disclosed until publicly announced on commencement day.

THESES OF THE GRADUATING CLASS.

1. Each student of the senior or graduating class shall each year, on or before the first Friday in March, in the forenoon, deliver to the president a written thesis on any subject, scientific or literary, which the said student, with the president's approval, may choose.

2. As soon as practicable thereafter, the president and the professor of English literature shall make to the faculty a report on the admissibility of said theses ; those which they agree to admit shall be admitted, and those which they agree to reject shall be rejected.

3. If they shall disagree as to the merit of a thesis, the decision shall lie with the faculty, who shall determine the question at their next ordinary meeting.

4. If any thesis shall be rejected, its author shall be required to rewrite it, or to write another, and deliver it to the president on or before the first day of May next ensuing, and in such case the president shall be the sole judge of its admissibility.

5. The merit of each accepted thesis shall be denoted by a number, according to a scale in which the maximum is 300, which shall be added to the number of marks otherwise attained by its author, and so count in the final estimate of his standing.

6. Any student failing to deliver a thesis on or before the date aforesaid, shall be debarred from graduating, unless he shall be able to prove to the satisfaction of the president that such failure was inevitable, in which case the president shall extend the period of delivery at his discretion.

7. No thesis will be accepted which shall occupy less than eight minutes in reading, at the ordinary rate of effective delivery.

8. No student whose thesis shall be so poor in merit as to be ultimately rejected shall receive a diploma except by special favor.

9. The graduating theses are to be retained by the college.

VALEDICTORIAN.

A list of the members of the graduating class, from whom the valedictorian may be chosen, will be made by the faculty and submitted to the class, who may select as valedictorian one of the number, subject to the approval of the faculty.

SYNOPSIS OF STUDIES.

FRESHMAN CLASS.

FIRST TERM.

Homer's *Odyssey*—3 books.
 Greek prose composition.
 Greek scanning and prosody.
 Odes and Epodes of Horace.
 Latin prose composition.
 Latin syntax and prosody.
 Geometry, and use of logarithmic tables.
 English Grammar and analysis; poets and prose writers of present time; rhetoric, and practical exercises in English composition; history of English literature.
 German; French.

SECOND TERM.

Herodotus—6th and 7th books.
 Greek prose composition.
 Cicero, *De Senectute* and *De Amicitia*.
 Latin prose composition.
 Algebra.
 English grammar and analysis; history of English literature; prose of Addison and Thackeray; rhetoric, and practical exercises in English composition.
 German; French.

SOPHOMORE CLASS.

FIRST TERM.

Medea, *Alcestis*, *Hippolytus*, or *Iphigenia in Tauris* of Euripides.
 Greek composition.
 Epistles of Horace; review of Latin prosody.
 Plane, analytical, and spherical trigonometry.
 General chemistry.
 Historical English grammar; history of the English language; poetry of Shakespeare; rhetoric, and practical exercises in English composition; history of English literature.
 German history.
 German; French,

SECOND TERM.

Xenophon's *Memorabilia* 2 books, or Thucydides 6th and 7th books; Greek composition, prose and verse.
 Livy, the twenty-first book; Latin prose composition.
 Spherical trigonometry; mensuration; surveying.
 General chemistry.
 Historical English grammar; history of the English language; poetry of Shakespeare; rhetoric, and practical exercises in English composition; history of English literature.
 French history.
 German; French.

NOTE.—German and French are elective studies. See regulations as to "Elective Studies," p. 26.

JUNIOR CLASS.

FIRST TERM.

A drama of Sophocles ; scanning and prosody.
 Juvenal ; composition in Latin verse.
 Analytical geometry.
 Heat.
 Botany.
 Anglo-Saxon grammar ; history of literature ; prose of Bacon ; poetry of Milton and Spenser ; rhetoric, and practical exercises in English composition.
 Logic.
 English history.
 German ; French.

SECOND TERM.

A dialogue of Plato, the Philippics of Demosthenes, or select orations of Lysias ; Greek prose composition, Cicero, *De Officiis* ; Latin prose composition and etymology.
 Mechanics.
 Magnetism ; electricity.
 Botany.
 Anglo-Saxon grammar ; history of literature ; prose of Bacon ; poetry of Milton and Spenser ; rhetoric ; and practical exercises in English composition.
 Psychology.
 Political economy.
 German ; French.

NOTE.—See regulations as to " Elective Studies," p. 26.

SENIOR CLASS.

FIRST TERM.

Two dramas of *Æschylus*, or the Olympic or Pythian Odes of Pindar ; choral scanning.
 Plautus, the *Mostellaria* ; archaic Latin, Latin orthography, and comparative philology.
 Differential calculus.
 Astronomy.
 Practical astronomy.
 Light.
 Higher physics.
 Chemistry.
 Qualitative analysis—laboratory work.

SECOND TERM.

Æschines or Demosthenes, Oration on the Crown ; or the Ethics or Politics of Aristotle ; or Republic of Plato ; history of Greek literature ; elements of comparative philology.
 Cicero's *De Natura Deorum*, or Epistles ; Latin inscriptions ; and lectures on Latin literature.
 Integral calculus.
 Astronomy.
 Practical astronomy.
 Sound.
 Higher physics.

FIRST TERM.

Botany.
 Geology and lithology.
 Anglo-Saxon reader; historical grammar of Anglo-Saxon and English languages; language and poetry of Chaucer; rhetoric, and practical exercises in essay writing.
 Psychology; history of philosophy.
 Philosophical essays.
 Constitutional history of Europe.
 Constitutional history of England.
 Political economy.
 Sanskrit.
 German; French; Italian; Spanish; Icelandic.

SECOND TERM.

Chemistry.
 Qualitative analysis—laboratory.
 Botany.
 Geology and lithology.
 Anglo-Saxon reader; historical grammar of Anglo-Saxon and English languages; language and poetry of Chaucer; rhetoric, and practical exercises in essay writing.
 Psychology; history of philosophy.
 Philosophical essays.
 Constitutional history of the United States.
 Constitutional history of England.
 Political economy.
 Sanskrit.
 German; French; Italian; Spanish; Icelandic.

NOTE.—All the studies are elective, subject to the provisions noted in the regulations as to "Elective Studies," page 26.

DEPARTMENTS OF INSTRUCTION.

THE GREEK LANGUAGE AND LITERATURE.

The course of study and the text-books used in the different classes are as follows :

FRESHMAN CLASS.

1st Term.—Homer's *Odyssey* (3 books); Homeric forms and syntax; scanning and prosody; exercises in writing Greek.

2d Term.—Herodotus (6th and 7th books); syntax of the moods, with exercises in writing Greek continued.

SOPHOMORE CLASS.

1st Term.—Medea, Alcestis, Hippolytus, or Iphigenia in Tauris of Euripides; choral scanning; exercises in prosody and in writing Greek.

2d Term.—Xenophon's Memorabilia (2 books), or 6th and 7th books of Thucydides; exercises in writing Greek prose continued, with occasional exercises in Greek versification.

JUNIOR CLASS.

1st Term.—A drama of Sophocles; choral scanning; exercises in writing Greek prose and in Greek versification continued; instruction will also be given by lecture on points connected with the Greek drama.

(Elective.)—Select Idyls of Theocritus, or selections from the lyric or dramatic poets.

2d Term.—One dialogue of Plato, or the Philippias of Demosthenes; select orations of Lysias; lectures on subjects connected with the course of reading. Greek philosophy or Attic law.

(Elective.)—Select orations of Lysias or Isocrates, or 6th and 7th books of Thucydides.

SENIOR CLASS.

1st Term (Elective.)—Two dramas of Æschylus, or the Olympic or Pythian Odes of Pindar; choral scanning; with occasional lectures on the subject of study.

2d Term (Elective.)—Demosthenes or Æschines, Oration on the Crown; or the Ethics or Politics of Aristotle; or Republic of Plato; or history of Greek literature by lecture and from text-book; elements of comparative philology.

THE LATIN LANGUAGE AND LITERATURE.

FRESHMAN CLASS.

1st Term.—Odes and Epodes of Horace; Latin syntax and prosody; with the scanning of Horace; Latin prose composition.

2d Term.—Cicero, De Senectute and De Amicitia; Latin prose composition.

SOPHOMORE CLASS.

1st Term.—The Epistles of Horace; review of Latin prosody, and exercises in etymology.

2d Term.—Livy, the twenty-first book; Latin prose composition.

JUNIOR CLASS.

1st Term.—Juvenal; composition in Latin verse.

(Elective).—Ovid's *Fasti* or *Lucan*.

2d Term.—Cicero, *De Officiis* or *Tusculan Disputations*; Latin prose composition.

(Elective).—Terence's *Andria* or *Adelphi*.

SENIOR CLASS.

1st Term (Elective).—Plautus, the *Trinummus* or *Moscellaria*, with the metres; archaic Latin, Latin orthography and comparative philology.

2d Term (Elective).—Cicero's *Epistles*; Latin Inscriptions.

In the freshman class, Latin prose composition is taught by printed exercises, as *Gildersleeve's*; the sophomore and junior classes are required to write in imitation of the author that they are reading at the time. The junior class also writes verse, and all the writing of the upper classes, whether in prose or verse, is done in the lecture room, under the direction and with the assistance of the tutor or professor.

Lectures on Latin literature are given to the classes in connection with their reading, whether it be history, philosophy, rhetoric, lyric poetry, satire, or the drama.

MODERN LANGUAGES AND FOREIGN LITERATURE.

The department of modern languages is arranged on the basis of a four years' undergraduate course, irrespective of college classes. The first three years are devoted mainly to the acquisition of the languages. In the fourth year lectures are delivered on literature and the elements of philology.

FRENCH.

FIRST YEAR.

Chardenal's *First French Course*.

O'Connor's *Choix de Contes Contemporains*.

Brachet and Dussouchet's *Petite Grammaire Française*, Part I.

SECOND YEAR.

Chardenal's Second French Course.

Roulier's Second Book of French Composition.

Brachet and Dussouchet's *Petite Grammaire Française*, Part II.

E. About, *La Mère de la Marquise*.

L. Halevy, *L'Abbé Constantin*.

Composition.

THIRD YEAR ; TWO OR FOUR HOURS A WEEK.

This year is divided into two courses.

First course (practical).

1. In class. Modern comedies: E. Pailleron, *Le Monde où l'on s'ennuie*; A. Belot, *Le Testament de César Girodot*.

Modern novels: Erckmann-Chatrian, *Madame Thérèse*; Balzac, *La Peau de Chagrin*.

2. Outside reading to the extent of 1,200 pages 12mo, with essays in French on works read.

Second course (literary).

1. In class. Composition; study of the masterpieces of the great writers of the seventeenth century, Molière, Corneille, Racine, Pascal, La Bruyère, Bossuet, Fénelon.

2. Outside classical reading to the extent of 1,000 pages, with essays in French on works read.

Chassang's *Grammaire Française (Cours Moyen)*. Translating from C. Mackay's *A Thousand and One Gems of English Prose*.

FOURTH YEAR.

Two courses are offered in the senior year.

The first course, wholly in French, will be of a literary character.

1. In class. (18th and 19th centuries.) Voltaire, *L'Essai sur les Mœurs*; J. J. Rousseau, *Le Contrat Social*; Victor Hugo, *Hernani*; Augier, *Le Fils de Giboyer*; Mérimée, *Colomba*. Exercises on idioms will be selected in Chardenal's Course for Advanced Pupils.

2. Outside reading to extent of 1,200 pages, 12mo.

The second course (philological). Brachet's *Grammaire Historique de la Langue Française*. Darmesteter and Hatzfeldt's *Morceaux Choisis des Écrivains du 16me Siècle*. Leon Gautier, *Chanson de Roland*.

OPTIONAL COURSE ; ONE HOUR A WEEK.

This course is open to all students of the French department. The instructor will deliver throughout the academic year a weekly lecture on France and its institutions, both political and literary.

After each lecture half an hour will be given to the discussion of the subjects dealt with in the course. This course will be entirely in French.

LECTURES.

Students of third and fourth years are admitted to lectures on literature.

1. History of French literature from the origin to the end of the seventeenth century ; twice a week.
2. History of French literature from the beginning of the eighteenth century down to our own days ; twice a week.
3. History of French literature during the eighteenth century (a special course in French) ; twice a week.
4. Lectures on philology, with special reference to French ; once a week.

ITALIAN.

FIRST YEAR.

Sauer's Grammar.

Reading from De Amicis's *La Vita Militare*.

SECOND YEAR.

Translating from Macaulay's *Essays on Italian Writers*.
Reading from Puccianti's *Antologia della Prosa Italiana Moderna*.

Comedies : Goldoni's *Il Bugiardo* ; Giacosa's *Acquazzoni in Montagna*.

Outside reading to the extent of 250 pages 12mo, with résumé in Italian.

THIRD YEAR.

Italian composition.

Manzoni's *I Promessi Sposi*.

Selections from Tasso, Ariosto, Boccaccio, Petrarca.

Outside reading to the extent of 500 pages 12mo, with résumé in Italian.

FOURTH YEAR.

G. Carducci's *Letture Italiane*.

Modern Poetry: selections from Puccianti's *Antologia della Poesia Italiana Moderna*; Dante.

Nannucci's *Manuale della Letterature del Primo Secolo della Lingua Italiana*.

Lectures: historical development of the Italian language; history of Italian literature.

SPANISH.

FIRST YEAR.

Josse's *Grammar*.

Mantilla's *Libro de Lectura*. Extracts from *Gil Blas*.

SECOND YEAR.

Gramática de la Academia.

Selections from *Don Quijote*.

One drama from Ochoa's *Piezas*.

Composition.

Outside reading to the extent of 250 pages 12mo, with résumé in Spanish.

THIRD YEAR.

Three dramas from Ochoa's *Piezas*.

Selections from Ochoa's *Poesias Escogidas*.

Outside reading to extent of 500 pages 12mo, with essays in Spanish.

FOURTH YEAR.

El Romancero del Cid.

Selections from earliest monuments in prose and poetry from *Escritores en Prosa Anteriores al Siglo XV.*; *Poetas Castellanas Anteriores al Siglo XV.*; vols. li. and lvii. of *Autores Españoles*, edition Rivadeneyra.

Lectures: Historical development of Spanish language; history of Spanish literature.

GERMAN.

FIRST YEAR; TWO HOURS A WEEK.

Whitney's *Brief German Grammar*.

Exercises in translation from the first part of Stahl's *German Versions*.

Twenty-five to thirty pages of text from Whitney's German Reader.

SECOND YEAR ; TWO HOURS A WEEK.

1st Term.—Schiller's Wilhelm Tell (Buchheim's edition) ; second part of Stahl's Versions ; Whitney's German Grammar, as book of reference.

2d Term.—Hart's selections from Goethe's Prose ; Stahl's Versions ; Whitney's German Grammar.

THIRD YEAR ; TWO OR FOUR HOURS A WEEK.

Schiller's Geschichte des dreissigjährigen Kriegs.

Exercises in dictation, conversation, composition, sight-reading from German, and translation at sight from English.

Outside reading to extent of 500 pages 12mo, with essays in German.

FOURTH YEAR ; TWO OR FOUR HOURS A WEEK.

First Course.—Goethe's Faust, first part entire and selections from second part.

Critical study of Lessing's Laokoön (Hamann's edition).

Second Course.—Reading of German plays (Benedix's Das Lügen, Freytag's Die Journalisten, etc.), with special reference to elocution and the study of colloquial German.

In connection with this latter course, outside reading to the extent 1,000 pages 12mo, with essays in German. This course will be conducted as far as possible in German.

LECTURE COURSES.

Students of third and fourth years are admitted to lectures on literature.

German literature ; two hours a week.

Comparative philology, with special reference to the German language ; one hour a week.

FOURTH YEAR.

ICELANDIC.

Sweet's Icelandic Grammar.

Vigfusson and Powell's Prose Reader.

ENGLISH LANGUAGE AND LITERATURE.

The course of study and the text-books used in the different classes are as follows :

FRESHMAN CLASS.

Bain's Higher English Grammar ; Quackenbos's Rhetoric and Composition, with practical exercises in writing English ; readings in contemporary English literature ; lectures on syntax ; lectures on English literature.

SOPHOMORE CLASS.

Lounsbury's History of the English Language ; Quackenbos's Rhetoric and Composition, with practical exercises in writing English ; play of Shakespeare—Macbeth ; lectures on historical grammar ; lectures on English literature.

JUNIOR CLASS.

Arnold's Manual of English Literature ; Bain's Composition and Rhetoric, with practical exercises in composition ; Sweet's Anglo-Saxon Primer ; essays of Bacon ; poetry of Milton and Spenser ; lectures on literature and rhetoric.

SENIOR CLASS—(Elective).

Sweet's Anglo-Saxon Reader ; Bain's Composition and Rhetoric, with practical exercises in essay-writing ; Morris's edition of Chaucer ; lectures on historical grammar of Anglo-Saxon and English languages, and on the form of English poetry.

MATHEMATICS.

The members of the sophomore class attend in mathematics three times per week throughout the year. They begin and complete plane, analytical, and spherical trigonometry and mensuration ; and solve many problems by construction and otherwise. They are instructed, also, during the second session, partly by lecture and partly from text-book, in surveying—embracing the measurement of lines and angles, the area or contents of ground, compass surveying, triangulation, leveling, topographical surveying, railway construction, the general methods of mining surveying, and the geodesic methods employed on the Coast Survey and on the great survey of the Western territories.

The surveying instruments—the chain and the tape; the surveyor's and the solar compass, the surveyor's transit, the level and the leveling rod, and the plane table—are shown and explained, and the students are practised, as far as possible, upon the necessary adjustments and the methods of use.

During the year the members of the freshman class attend five times per week. They complete, during the first session, plane, volumetric, and spherical geometry, with applications to the solution of problems, and are taught and practised in the use of logarithms of numbers. During the second session they are instructed in algebra, including Sturm's theorem, the general demonstration of the binomial theorem, etc., and are practised in the applications of algebra to geometry.

Each of the classes has an occasional lecture upon the logic and utility of mathematics, and upon the models—geometric, metric weights and measures, etc.—which belong to the department.

Text-books.—Freshman class: 1st term, Davies' Legendre to article 20 plane trigonometry; 2d term, Peck's Manual of Algebra. Sophomore class: trigonometry (Davies' Legendre) to article 78 in spherical trigonometry; 2d term, trigonometry and mensuration (Davies' Legendre), Davies' Surveying (revised edition).

MATHEMATICS AND ASTRONOMY.

The subjects of instruction embraced in this department are analytical geometry, calculus, mechanics, and astronomy, all of which are elective studies.

I. Analytical geometry and calculus.—These subjects are taught by means of text-books that have been compiled and collated for the purpose. Analytical geometry is taught to the junior class. It embraces the general principles of analysis, with special applications to the straight line, the conic sections, and the elements of geometry of three dimensions. The calculus is taught to the seniors. The course in this branch is thorough and sufficiently extensive to meet the wants of the engineer, the astronomer, and the student of general science.

Text books—Junior class: 1st term, Peck's Analytical Geometry. Senior class: 1st term, Peck's Practical Calculus (differential); 2d term, Peck's Practical Calculus (integral).

II. Mechanics.—This branch is taught during the second term of the junior year, partly from a text-book and partly by lectures, illustrated by models, of which the department has a complete collection. The course of instruction embraces the following subjects :

Composition and resolution of forces ; principle of moments ; centre of gravity ; elementary machines ; friction and other hurtful resistances ; laws of uniform and uniformly varied motion ; the pendulum ; centrifugal force and its application to the governor ; moment of inertia and its application to the fly-wheel ; mechanics of fluids, with application to pumps, hydraulic presses, and water-wheels ; buoyancy and flotation, with applications to specific gravity ; mechanics of gases and vapors, with applications to the barometer, the air-pump, siphons, etc.

Besides the apparatus usually employed to illustrate this subject, the department possesses a very complete set of Schroeder's working models to illustrate the principal elementary combinations of mechanism ; also a set of Willis's apparatus for experimental determinations.

Text-book: Peck's Mechanics.

III. Astronomy.—This subject is taught by means of a text-book, with explanatory lectures and lantern illustrations. The course is mostly descriptive, but it embraces a sufficient amount of physical and spherical astronomy to enable the student to comprehend the general theory of planetary motions, tides, and eclipses, and also to understand the various methods of determining time, longitude, and latitude.

Besides this course, which is pursued by the students of the senior class who may elect it, there is also an optional course in practical astronomy that may be taken by any student, and which may be pursued to any extent he may desire. For this class of students an observatory has been provided, and furnished with all necessary instruments and appliances.

Text-book: Peck's Popular Astronomy.

PRACTICAL ASTRONOMY.

This study is elective or is optional with the members of the senior class who have the requisite mathematical knowledge.

The class is given two hours weekly during the senior year.

Text-book: Chauvenet's Spherical and Practical Astronomy.

The exercises consist in lectures upon the various instruments and their use; recitations from the text-book and lectures; and the reduction and discussion of the observations made by members of the class.

Each student is required to do a certain amount of work in the observatory and to reduce his observations.

The main subjects taught in the course embrace the following :

- I. The derivations of the fundamental equations of spherical astronomy.
- II. Sextant and reflecting circle :
 - (1) Theory of the instruments; adjustments and errors.
 - (2) Determination of local time :
 - (a) By single altitudes of the sun or stars.
 - (b) By equal altitudes of the sun.
 - (3) Determination of latitude :
 - (a) By single altitudes of the sun.
 - (b) By circum-meridian altitudes of the sun.
 - (c) By altitudes of the pole star and a corresponding southern star.
- III. Transit instrument :
 - (1) Theory of the instrument; errors and adjustments.
 - (2) Time determinations by star transits, including the making of an observing list and the accurate calculations of the instrumental corrections.
 - (3) Reduction of a set of observations by the method of least squares.
- IV. Zenith telescope :
 - (1) Theory of the instrument; errors and adjustments.
 - (2) Determination of the latitude from star observations, including the preparation of the observing list and independent determination of instrumental constants.
 - (3) Complete set of observations reduced by method of least squares.
- V. Prime vertical instrument :
 - (1) Theory of the instrument; errors and adjustments.
 - (2) Determination of latitude and instrumental constants.

VI. Astronomical theodolite :

- (1) Azimuth by observations of the pole star.
- (2) Latitude and time by Gauss's "three-star method."

VII. Equatorial instrument :

- (1) Theory of the instrument ; errors and adjustments.
- (2) Measurement of double stars with the wire micrometer.
- (3) Determination of the place of a comet or a minor planet by the ring micrometer.
- (4) Use of the spectroscope in studying the sun and star spectra and solar protuberances.

VIII. Miscellaneous :

- (1) Value of level divisions obtained by means of the "level trier."
- (2) Investigation of the errors of a micrometer screw.
- (3) Determination of "personal equation" by Eastman's machine.
- (4) Practice in the operations of the determination of difference in longitude by the electric telegraph.
- (5) Determination of the eccentricity, errors of graduation, etc., of circles.

I., II., III. (1) and (2), IV. (1), VI. (1), VII. (1), VIII. (1), are required of all students in the course. The other subjects are given out according to the ability and the time at the disposal of the student.

PHYSICS.

The study of physics is elective with the members of the junior and senior classes.

The junior class is engaged two hours per week during the first session on the subject of heat, embracing expansion of solids, liquids, and gases ; mercurial and air thermometers ; maximum and minimum thermometer ; conduction of heat by solids, liquids, and gases ; tension of vapors, high and low pressure steam-engines ; radiant heat ; latent heat of liquids and gases ; specific heat, etc. During the second session two hours per week are occupied with properties of magnets ; terrestrial magnetism ; magnetic attractions and repulsions ; frictional electricity ; theories of electricity ; electrical attraction and repulsion ; electrical induction ; electrophorus ;

Holtz machine; electrical spark, nature and duration of; Leyden jar; Lichtenberg's figures, etc.; Galvani's observations; Volta's experiments; Voltaic battery; constant batteries; dry piles; Oersted's fundamental experiment; tangent compass; galvanometer; Ohm's law; thermal, luminous, and chemical effects; decomposition of salts; electro-metallurgy; attractions and repulsions of currents by currents; electro-magnets; chemical telegraphs; Morse telegraph; ocean telegraph; induction by magnets; magneto-electric apparatus; Ruhmkorff coil, etc.

The senior class is engaged three hours per week during the first term in studying the subject of light, embracing the topics of transmission, velocity, and intensity of light; photometers; reflection and refraction of light; plane, concave, and convex mirrors; spherical aberration; prisms; total reflection; dispersion by prisms; spectroscope, chemical and solar lines; lines from fixed stars; concave and convex lenses; achromatism; camera obscura; simple and compound microscope; astronomical and terrestrial telescopes; the eye and vision, etc. During the second term they are employed the same length of time weekly in the study of sound, embracing the nature of sound waves; velocity through gases, liquids, and solids; reflection of sound; refraction; interference; measurement of wave lengths; measurement of number of vibrations; vibrations of strings; musical scale; vibration of plates and bells; organ pipes, flute pipes, reed pipes; vibrations of tuning-forks determined with chronograph; Lissajous's figures; resonance; human voice; vowel sounds; the ear and audition, telephone, microphone, etc.

Such seniors as desire it are also instructed during the first and second terms two hours per week in electricity, including electro-statics; determination of constants of battery; measurement of resistances; theory of dynamo-electric machines; electric lighting; etc., etc. Also in the undulatory theory of light; propagation by waves; reflection, refraction, total reflection; interference of light; Fresnel's experiments; Newton's thin plates explained by undulatory theory; thick plates explained in the same manner; double refraction in uniaxial and biaxial crystals; conical refraction; plane polarization; circular, elliptical, and rotary polarization; and finally, in the mechanical theory of heat; determination of the mechanical equivalent; conversion of heat into work; application to the steam-engine and to animals; first and second laws of thermo-dynamics;

isothermals, adiabatic lines; Carnot's engine, kinetic theory of gases, etc.

Text-book: Atkinson's Ganot's Physics.

CHEMISTRY.

The sophomore class attends one exercise a week in general chemistry throughout the year. The instruction is given chiefly by lectures, with the aid of Fowne's Elementary Chemistry as a text-book. The students are expected to take notes and to pass monthly examinations on the subjects taught. During the year the general principles of chemistry are expounded, and a brief elementary description is given of each of the common elements, including its history, occurrence in nature, mode of preparation, physical and chemical properties, compounds, functions in nature, and uses in the arts. In addition to this a brief outline of vegetable and animal chemistry is presented.

General chemistry is taught during the senior year also, as an elective study, three times a week, by lectures and recitations, with the aid of Fowne's Elementary Chemistry as a text-book. Members of the senior class who desire it are permitted to attend every afternoon in the qualitative laboratory to take a practical course in qualitative analysis.

In this course a full exposition is given of principles and details, both of inorganic chemistry and organic chemistry.

The lectures are illustrated by very complete cabinets of chemical specimens, which are constantly open for examination and study by the students.

GEOLOGY AND PALÆONTOLOGY.

The studies in this department are elective—geology with the members of the senior class, and botany with the members of the junior and senior classes. Those who elect them attend, in each subject, once a week throughout the year.

In geology, the seniors are instructed, during the first session, by lectures and practical exercises, in mineralogy; in lithology, embracing the minerals which form rocks and rock masses of the different classes; and in cosmical and physiographic geology. During the second session they are instructed, by lectures, in historical geology. Students are required to read, in connection with the lectures, Dana's Manual of Geology.

In botany, the juniors and seniors are instructed, throughout the year, by lectures, and are required to read, in con-

nection with the lectures, Gray's First Lessons or Botanical Text-Book.

A geological collection of over 100,000 specimens and a botanical collection of about 60,000 species are accessible to the students for observation and study.

PHILOSOPHY, ETHICS, AND PSYCHOLOGY.

The subjects taught in this department are logic, psychology, and the history of philosophy. The study of logic is begun in the junior year; the text-book used is Jevons's Lessons in Logic, with references to more advanced treatises. The study of psychology is begun in the second term of the junior year, and is continued throughout the senior year. Instruction is given by lecture, and Murray's Handbook of Psychology is used as a text-book, with references to more advanced treatises. The history of philosophy is taught by lecture throughout the senior year. Ethics is taught partly by lecture and partly by text-book throughout the senior year. Numerous graduate courses on philosophical subjects are given (see p. 52).

HISTORY, POLITICAL SCIENCE, AND INTERNATIONAL LAW.

SOPHOMORE CLASS.

1st Term.—German history, in Freeman's Historical Course—the whole book.

2d Term.—French history, in Freeman's Historical Course—the whole book.

JUNIOR CLASS.

1st Term.—English history, in Freeman's Historical Course—the whole book.

SENIOR CLASS.

<i>1st Term.</i>	{ (Elective.) Constitutional history of Europe—lectures. (Elective.) Constitutional history of England—lectures.
<i>2d Term.</i>	{ (Elective.) Constitutional history of the United States—lectures. (Elective.) Constitutional history of England—lectures.

History.—During sophomore and the first half of junior year the course in history occupies two hours per week.

The instruction to the senior class in history of Europe occupies four hours per week during the first term, in United States history four hours per week during the second term, and in English history two hours per week throughout the year.

POLITICAL ECONOMY AND SOCIAL SCIENCE.

JUNIOR CLASS.

2d Term.—Laveleye's Elements of Political Economy.

SENIOR CLASS.

1st Term.—(Elective.) Historical and practical political economy—lectures.

2d Term.—(Elective.) Taxation and Finance—lectures.

The instruction to the junior class occupies two hours per week for one term, and to the senior class four hours per week throughout the year.

CABINETS AND COLLECTIONS.

A brief account of collections and cabinets is subjoined :

A chemical museum illustrating fully elementary chemistry, several thousand specimens of materials and products illustrating applied chemistry, including suites of materials, the products of the various operations, and diagrams of machinery and apparatus ; especially rich are the collections illustrating common salt, aluminium, phosphorus, matches, sulphur and sulphuric acid, photography, photo-relief printing, photo-lithography, electro-metallurgy, petroleum, coal gas, coal tar and its products, pigments, dyeing and calico printing, tanning, glue, india-rubber, beet and cane sugar, ceramics, glass, fertilizers, disinfectants, etc.

A lithological collection of 5,000 specimens of rocks and the minerals that make rocks.

A collection of about 75,000 specimens illustrating historical geology, in which the rocks and characteristic fossils of all the different formations are arranged in such order as to represent the geological column.

A collection of ores, coals, oils, clays, building materials, etc., believed to give the fullest representation of the mineral resources of the United States of any collection yet made.

A palæontological series, which includes collections of recent and fossil vertebrates, articulates, mollusks, radiates, and plants; in this series is to be found the largest collection of fossil plants belonging to any institution in the country, including many remarkably large and fine specimens, and over 200 species of which representatives are not known to exist elsewhere; also the most extensive series of fossil fishes in the country, including, among many new and remarkable forms, the only specimens known of the gigantic *dinichthys*; a suite of Ward's casts of extinct saurians and mammals; fine skeletons of the Irish elk, cave bear, New Zealand moas, *ichthyosaurus*, *teleosaurus*, etc.; several hundred maps and diagrams illustrating the subjects taught, with lanterns, microscopes, and over 2,000 slides to be used with them.

A set of models, Schröder's and others, illustrating the subjects of geometry, of two and three dimensions; Schröder's models of descriptive geometry; a set of metric weights and measures, etc.; a full set of surveying instruments, as chains, surveyor's compass, miner's compass, solar compass, transit, surveyor's level, plane table, etc.

A mechanical collection, embracing models in pulleys, levers, screw, inclined plane, parallelogram of forces, Atwood's machine, reversible pendulum, air-pump, aërostatic apparatus, hydrostatic apparatus, balance and apparatus for specific gravity, etc.; Schröder's mechanical combinations, illustrating the subject of mechanics in all its branches.

The new observatory is provided with a forty-six inch transit instrument, by Troughton & Simms; an equatorially mounted refractor, of five-inch aperture, to which is attached a spectroscope, with the dispersive power of twelve flint-glass prisms, of fifty-five degrees, by Alvan Clark; a set of comparison apparatus with electrodes, Plücker's tubes, coil, etc., accompanies the spectroscope; altitude and azimuth instrument, declination transit, mean-time chronometer and break-circuit sidereal chronometer, a fine clock by Howard & Co., chronograph, heliostatic mirrors, sextant and reflecting circle, combined transit and zenith telescope, personal equation machine, complete apparatus for longitude determinations by electric telegraph, Thomas's arithmometer, etc. In addition to these instruments, the observatory has been presented by Mr. Lewis M. Rutherford with his equatorial telescope of thirteen-inch aperture, supplied with a correcting lens for photographic work and all necessary appliances; a transit of three-inch aperture by Stackpole &

Brother ; a sidereal clock by Dent ; a measuring micrometer for photographs, by Stackpole ; two position micrometers, etc.

A large collection of physical apparatus, among the pieces of which may be mentioned a Foucault's pendulum twenty-six feet in length, and a complete Foucault gyroscope, by Froment ; a fine cathetometer by Grunow, a spherometer, a comparateur, standard U. S. yard, standard metre, a new air-pump by Grunow, etc.

Acoustic apparatus, such as (*e. g.*) Helmholtz's apparatus for the reproduction of the vocal sounds ; Seebeck's siren ; a complete phonautograph ; a set of Meldes's tuning-forks ; Lissajous's tuning-forks and vibrating microscope ; a set of Helmholtz's resonators and vowel forks.

Magnetic and electric apparatus, of which may be mentioned a Wallace dynamo-electric machine, a Lamont's declination compass, Wiedemann's galvanometer, Grunow's spark micrometer, torsion balance ; sine and tangent compass ; an original Holtz machine ; a large Richie coil ; also a Ruhmkorff coil, a diamagnetic apparatus, Wheatstone bridges, and Thomson galvanometers and electrometers.

An extensive optical apparatus, of which may be noted a large spectrometer by Grunow ; rule plates for measuring wave lengths, made on Rutherford's machine ; apparatus for conical refraction ; various sections of wave surfaces ; Fessel's and Wheatstone's wave machines ; Jamin's interferential refractor, Duboscq's apparatus for studying the interference and diffraction of light ; a large Nachet inverted microscope ; polarizing apparatus for projection—some of the pieces of this latter may be mentioned on account of their size, such as a double refracting prism, three inches in diameter ; a Nicol's prism, two and one half inches in diameter and seven inches long ; a Foucault prism, four inches in diameter and seven inches long, etc., etc.

A botanical collection, containing about 60,000 species, phænogams and cryptogams. It is peculiarly rich in what are called type specimens, *i. e.*, the identical plants named by the authors who have described or noticed them in their published works. It possesses extensive collections of plants from the North Pacific Exploring Expedition, from Commodore Perry's Japan Expedition, from the various expeditions of Fremont, and from the explorations of North America, even within the Arctic Circle, besides many rare and valuable specimens from all parts of the world. It embraces the collection of the late Prof. John Torrey, which is

valuable as containing the original specimens from which was prepared the Flora of North America; the Meissner-Crooke collection, which is the authority for the polygonaceæ, proteaceæ, thymelaceæ, etc., of De Candolle's *Prodromus*; the Chapman collection, containing the originals from which was prepared the Flora of the Southern United States, and the original bryological collection with all the types of the late C. F. Austen.

With the herbarium is connected a botanical library containing over seventeen hundred volumes. Besides embracing most of the books required for ordinary investigations, it is rich in scarce memoirs and separate papers received from their authors, such as cannot be purchased, and yet are often of greater value to the scientific investigator than costly volumes.

LIBRARY.

The library is open to all officers, students, and graduates, for borrowing and reference, daily, except Sundays and Good-Friday, throughout the year, including all holidays and vacations.

It now contains 80,000 carefully selected volumes, and additions are constantly made of the best books in all departments, especially of extensive and costly works not readily accessible elsewhere. Nearly five hundred different serials, including the leading periodicals, transactions of societies, etc., in all languages, are regularly received, and special effort is made to provide for immediate use without the formality of asking, the best reference books in all departments—dictionaries, encyclopædias, indexes, compends, etc.

Each week the leading American and foreign publications are placed on inspection shelves, and from these all the more valuable are selected and added to the library. About 10,000 bound volumes and nearly as many more unbound volumes and pamphlets are now added yearly.

Besides the regular author and title catalogues, there are a minute subject classification on the shelves; a complete subject-catalogue, in a separate book for each class; an exhaustive card-catalogue, with analyses and notes for readers; and a very full printed index of topics. To all catalogues,

indexes, and other aids and guides, all students have unrestricted access, day and evening.

A pamphlet giving fuller information about books, building, catalogues, and the privileges accorded to readers, will be mailed on application to Melvil Dewey, chief librarian, Columbia College, N. Y.

PRIZES.

I.—PRIZE OF THE ALUMNI ASSOCIATION.

A prize of fifty dollars in money or its equivalent, at the option of the receiver, established by the Association of the Alumni of Columbia College, was first awarded at the commencement in June, 1858.

It is to be given "to the most faithful and deserving student of the graduating class."

Three names are selected by the faculty and submitted to the class, who from these three designate one to receive the prize. Should the class at any time fail to make the selection, and give notice thereof to the president of the college, at least ten days prior to the day appointed for commencement, the selection of the student to receive the prize may be made by the faculty.

II.—SCHEME OF TWO ANNUAL SEMINARY PRIZES.

Founded November, 1851, by the Rev. Dr. John McVickar through the Society for Promoting Religion and Learning, and for which an endowment of \$1,000 is provided on the following conditions:

1. The first, to be entitled The Society's Greek Seminary Prize of Thirty Dollars, to be annually competed for among such members of the graduating class as shall have given in their names to the president, at least one month previous to such competition, as candidates for the General Theological Seminary of the Protestant Episcopal Church, each student giving in his name as competitor to designate the prize for which he contends, and to be confined to the choice then made. The examination for such prize to be held publicly in the chapel, and separate from the general examination. To be on:

- a.* The Epistles of the New Testament (in Greek) "*ad aperturam libri.*"

b. On some one of the early Greek Fathers, to be designated at the time of noticing the prize, or, if none be designated, then upon some portion of Chrysostom or Athanasius, at the choice of the student.

The decision to be with the president and the professor of Greek.

2. The second, to be entitled The Society's English Seminary Prize of Twenty Dollars, to be annually competed for as before, and to consist in the production of an essay (to be publicly read, or not, as the president may determine), of the ordinary length of a pulpit discourse, on some subject connected with the course of evidences on which the class has been engaged; such subject to be selected by the professor of the evidences, and given out by him at the time of notice; and the prize to be adjudged, as before, by the president and the professor of that branch; such decision to have respect to—

a. The general ability and soundness of the essay;

b. Its logical and demonstrative form; and

c. The pure Saxon style and idiom in which it is written.

The names of the successful candidates to be enrolled in a suitable book, to be provided for that purpose, lettered appropriately, and kept on the library table; to be announced with other honors on commencement day, and also recorded honorably in the Society's books.

III.—CHANLER HISTORICAL PRIZE.

In 1877, Mr. J. Winthrop Chanler, an alumnus of the college of the class of 1847, bequeathed "to the Trustees of Columbia College in the city of New York, the sum of one thousand dollars, to be invested and kept invested, and the income thereof to be given annually, on the commencement day, to the undergraduate member of the senior class of said college who shall be the author of the best original manuscript essay in English prose on the history of civil government in America, or some other historical subject, the same to be determined by the judgment and decision of the faculty of said college." The bequest became available in 1879.

IV.—PRIZE SCHOLARSHIPS AND FELLOWSHIPS.

By resolutions of the Board of Trustees, there have been established fourteen scholarships of the annual value of one hundred dollars each; and seven fellowships of the annual value of five hundred dollars each.

Four of the scholarships are offered for competition to members of the freshman class—one in Latin, one in Greek, one in mathematics, and one in rhetoric.

Five are offered for competition to members of the sophomore class—one in Latin, one in Greek, one in mathematics, one in history, and one in chemistry.

Five are offered for competition to members of the junior class—three in literary and two in scientific studies, viz.: one in Greek, one in Latin, one in logic and English literature, one in mechanics, and one in physics.

The examinations for these scholarships are held immediately after the final examination of the classes for the year, and are open to all members of the several classes who are in good and regular standing in their respective classes.

The fellowships are conferred annually by the trustees, on the written recommendation of the faculty, upon such graduates as propose to enter upon a course of study for higher attainments, in letters or science, and who shall be adjudged by the faculty to be capable of attaining, and likely to attain, distinction in such course of study.

The fellows are required to pursue a course of study under the direction of the president, and to discharge such duties as assistants in the several departments as may be assigned them, for the term of three years, at the end of which time the fellowship expires by limitation.

Additional fellows, called tutorial fellows, are occasionally appointed to give such assistance as may be required of them in the departments to which they may be assigned.

The payments on account of the prize scholarships and fellowships are made in two equal instalments, payable on November 15th and May 15th.

JOHN TYNDALL FELLOWSHIP FOR THE ENCOURAGEMENT OF RESEARCH IN PHYSICS.

In June, 1885, Professor John Tyndall, of London, presented to the college \$10,800, for the encouragement of scientific research. With this fund the trustees established the fellowship bearing his name.

The fellowship is to be held by some suitable person, who shall be either a graduate or a student, not necessarily a candidate for a degree, in some department of Columbia College, who shall devote himself faithfully to the investigation of some subject in physical science, at this college or at some other in this country or abroad, under the supervision and

direction of some known physicist, approved by the president and the faculty of the School of Mines. The appointment to the fellowship to be made on the recommendation of the president and faculty of the School of Mines, to be for one year only, but renewable from year to year, and forfeitable at any time by non-fulfilment of obligations on the part of the fellow. The holder to receive the net income from the fund, which the trustees guarantee shall not be less than \$648.

DEGREES.

The degree of bachelor of letters, bachelor of science, or bachelor of arts, will be conferred upon members of the senior class who shall have satisfactorily finished their course, according to the character of the studies chiefly pursued by them—the requirements being, for BACHELOR OF LETTERS, all the classics and none of the science of junior and senior years; for BACHELOR OF SCIENCE, all the science and none of the classics of junior and senior years; for BACHELOR OF ARTS, a mixed course of classics and science in junior and senior years.

DEGREE OF MASTER OF ARTS

An alumnus of this college may receive the degree of master of arts, in three years after the date of his first diploma, on passing a satisfactory examination for the same; if, however, he shall pursue a course of study for such degree for a term of at least one year in the Graduate Department of the college, he may at the close of such term of study receive the degree of master, on passing an approved examination upon the subjects embraced in one at least of the six groups following, viz.:

Greek.	Philosophy.	Mathematics.
Latin.	Ethics.	Mechanics.
English.	Logic.	Astronomy.
Physics.	Constitutional law.	
Chemistry.	Roman law.	
Geology.	Comparative jurisprudence.	

Any three of the languages classified generally as the Romance languages and the Germanic languages.

Bachelors of arts of other colleges who shall have satisfied the college faculty that the course of study for which they received the bachelor's degree is equivalent to that for which the bachelor's degree is given in Columbia College, or shall have passed such examination as the faculty may prescribe, may be admitted to the degree of master of arts on the same terms and conditions as are prescribed for the admission of bachelors of arts of Columbia College to the same degree.

Candidates will be allowed to offer for examination any one or more of the books or subjects named in the following list, in each of the three departments belonging to the group elected by them, viz.:

FIRST GROUP.

GREEK.

Aristotle:	Æschines and Demosthenes:
Ethics; or,	De Corona; or,
Politics; or,	De Falsa Legatione.
Rhetoric and Poetic.	
Plato:	Thucydides:
Gorgias; or	Two books.
Three books of the Republic, or other portions equal in extent (made by approval).	The Orations of Antiphon and Andocides; or, of
Pindar:	Lysias; or, of
Olympic and Nemean Odes; or,	Isæus.
Pythian and Isthmian Odes.	The Poems of Hesiod.
Æschylus, two plays; or,	Theocritus, Bion, and Moschus.
Sophocles, two plays.	

No book to be offered which has formed part of the reading of the candidate during the undergraduate course.

LATIN.

<i>Philosophy.</i>	<i>Oratory.</i>
Cicero:	Cicero:
Academica; or,	In Verrem I.; or,
De Natura Deorum; or,	Philippica II.; or,
De Finibus.	Pro Roscio Amerino.

<i>History.</i>	<i>Biography.</i>
Tacitus : Annales, two books; or, Historiæ, two books.	Suetonius, two lives.
<i>Rhetoric.</i>	<i>Lyric and Elegiac Poetry.</i>
Cicero : De Oratore; or, Orator; or, Quintilian, the tenth book, and Tacitus, De Oratoribus.	Catullus; or, Tibullus; or, Propertius.
	<i>Dramatic Poetry.</i>
	Plautus, two plays; or, Seneca, two plays. Nævius and Pacuvius; or, Ennius.

No book to be offered which has formed part of the reading of the undergraduate course.

ENGLISH LITERATURE.

1. Gothic grammar, with reading of prescribed portion of Ulfilas.
2. Béowulf, with examination on inflection and syntax of Anglo-Saxon words.
3. Any great classic of the English language, of prescribed extent, in connection with life of author, with analysis of the work itself, with minute study of the style, and with explanation of rhetorical figures and historical and other allusions.

SECOND GROUP.

PHILOSOPHY, ETHICS, AND PSYCHOLOGY.

1. The history of ancient philosophy.
Zeller's *Geschichte der griechischen Philosophie*.
Ueberweg's *History of Philosophy*, Vol. I.
Schwegler's *History of Philosophy*.
Erdmann's *Geschichte der Philosophie*.
or,
The history of mediæval and modern philosophy.
Zeller's *Geschichte der deutschen Philosophie*.
Ueberweg's *History of Philosophy*, Vol. II.
Schwegler's *History of Philosophy*.
Harms's *Die deutsche Philosophie seit Kant*.

Kuno Fischer's *Geschichte der neuen Philosophie*.
 Stöckl's *Geschichte der neuen Philosophie*.

or,

- A special acquaintance with the system of some important philosopher or school ; the choice of such system to be subject to the approval of the professor.
2. Psychology. A knowledge of the psychological theories of at least two different contemporary schools or philosophers.
 Herbert Spencer's *Psychology*.
 Bain's *Senses and Intellect*.
 Sully's *Outlines of Psychology*.
 Volkmann's *Psychologie*.
 3. Logic. Any one of the following works or its equivalent :
 Mill's *System of Logic*.
 Ueberweg's *System of Logic*.
 Jevons's *Principles of Science*.
 Lotze's *Logic*.
 Bradley's *Principles of Logic*.
 Hamilton's *Logic*.
 De Morgan's *Logic*.
 4. Ethics. Any one of the following works or an equivalent :
 Sidgwick, *The Methods of Ethics*.
 Spencer, *The Data of Ethics*.
 Wilson and Fowler, *Principles of Morals*.
 Green, *Prolegomena to Ethics*.
 Von Hartmann, *Phänomenologie des sittlichen Bewusstseins*.
 Calderwood's *Moral Philosophy*.
 Martensen's *Ethics*.
 Martineau's *Types of Ethical Theory*.

THIRD GROUP.

MATHEMATICS.

- | | |
|-------------------------|------------------------------------|
| 1. Determinants. | 4. Differential equations. |
| 2. Quaternions. | 5. Calculus of finite differences. |
| 3. Theory of equations. | 6. Calculus of variations. |

MATHEMATICS AND ASTRONOMY.

1. Bartlett's *Analytical Mechanics*.
2. Bartlett's *Spherical Astronomy*.

PRACTICAL ASTRONOMY.

1. Chauvenet's Spherical and Practical Astronomy.
 2. Watson's Theoretical Astronomy.
 3. Work in the observatory—observing and reducing observations.
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FOURTH GROUP.

PHYSICS.

1. Maxwell on Theory of Heat.
2. Fleeming Jenkin, Electricity.
3. H. Lloyd, Wave Theory of Light.
4. Schellen, Spectral Analysis.
5. H. Helmholtz, Tonempfindungen ; English translation.

CHEMISTRY.

1. Roscoe and Schorlemmer, Treatise on Chemistry.
2. Hoffman, A. W., Introduction to Modern Chemistry.
3. Cooke, Josiah P., The New Chemistry.
4. Day, C. E., Chemistry in its Relations to Physiology and Medicine.
5. Thudicum, J. L. W., Annals of Chemical Medicine.

GEOLOGY.

1. General geology—
 Lyell's Principles of Geology.
 Von Cotta—Die Geologie der Gegenwart.
 Physical Geology. Dr. A. H. Green.
2. Applied geology—
 Page's Economic Geology.
 Burat—Geologie Appliqué.
 Von Cotta and Prime—Ore Deposits.
 Phillip's Ore Deposits.
3. Palæontology—
 Nicholson's Palæontology.
 D'Orbigny—Palæontologie Élémentaire.
 Owen's Palæontology.
 Zittell's Palæontologie.
4. Lithology—
 Dana's Manual of Lithology and Mineralogy.
 Von Cotta and Lawrence's Rocks.
 Les Roches. Ed. Jannetaz.

FIFTH GROUP.

CONSTITUTIONAL LAW.

1. English Institutions. Cox.
2. Das deutsche Staatsrecht. Von Rönne.
3. Histoire Parlementaire de France. Duvergier de Hauranne.
4. Constitutional History of the United States. Von Holst.
5. Histoire du Droit des Gens. Laurent.
6. Das diplomatische Handbuch. Ghillany.
7. History of International Law. Wheaton.
8. Lehre vom modernen Staat. Bluntschli.
9. Political Science. Woolsey.
10. Public Law of England. Bowyer.

ECONOMICS.

1. The principles of political economy, either J. S. Mill, Principles of Political Economy, or Wm. Roscher, Principles of Political Economy.
2. The history of political economy, either Blanqui, Histoire de l'Économie Politique, or Kautz, Geschichte der Nationalökonomie.
3. One of the following special subjects, viz. :
 - (a) Finance, W. S. Jevons, Money and the Mechanism of Exchange, together with B. Price, Currency and Banking.
 - (b) Commerce, Leone Levi, History of British Commerce, and H. Fawcett, Free Trade.
 - (c) Socialism, Schäffle, Kapitalismus und Socialismus.

HISTORY.

The candidate will be expected to present himself for examination in the general history of one of the following countries: Rome, England, Germany, France, or the United States.

SIXTH GROUP.

Any three of the languages classified generally as the Romance languages and the Germanic languages.

INSTRUCTION FOR GRADUATES.

The following are the courses for the year 1887-8.

GREEK.

Selections from the authors named in the plan of study for the degree of master of arts: three times a week.

Greek Inscriptions.

LATIN.

First term.—Lucretius: three times a week.

Second term.—Cicero's Orations against Verres: three times a week.

Comparative etymology.

SANSKRIT.

Whitney's Grammar; Lanman's Reader; Perry's Primer: two or more hours per week, classes being formed as necessary.

ENGLISH LANGUAGE AND LITERATURE.

Course of lectures on Gothic grammar and the relation between the Teutonic and the other Indo-Germanic languages. Course of reading in *Ulfilas*, *Béowulf*, and the leading writers of the early English and middle English period. Preparation of thesis on some point of Teutonic philology, or of English literature or philology.

MODERN LANGUAGES.

Both in the Romance and the Germanic departments, parallel courses, extending over two years, in literature and philology are offered.

1. In Romance department.—Lectures on the history, phonology, morphology, dialectology, and comparative

grammar of the Romance languages, and lectures on literature. Courses, philological and literary, in old French, Provençal, Catalan, Portuguese, Wallachian, and Raetoroman. Seminar in philology and literature.

2. In Germanic department.—Lectures on the history, philology, morphology, and comparative grammar of the Germanic languages. Lectures on literature. Courses, literary and philological, in Gothic, old high German, middle high German, low German, Dutch, Icelandic, Swedish, Danish. Seminar in philology and literature.

3. Comparative literature, with lectures.

PHILOSOPHY.

1. German philosophy, from Kant to Hegel. Prof. Alexander: once a week for half the year.

2. English philosophy: the development of skepticism from Locke to Hume. Prof. Alexander: once a week for half the year.

3. History of modern pessimism. Prof. Alexander: once a week for half the year.

4. Plato's theory of knowledge. Prof. Alexander: once a week for half the year.

5. Contemporary English ethics. Prof. Alexander: once a week for half the year.

6. Higher logic. Dr. Butler: twice a week from October until February.

7. The ethics of Kant. Dr. Butler: once a week from February until May.

8. Critique of the associational school. Dr. Butler: once a week from February until May.

9. Pedagogics. Dr. Butler: once a week throughout the year.

10. Seminar, for the study and discussion of philosophical topics. Dr. Butler: twice a week throughout the year.

HISTORY AND POLITICAL ECONOMY.

Courses the same as those in the School of Political Science, for the particulars of which see the circular of that school.

MATHEMATICS.

Selections from the subjects named in the plan of study for the degree of master of arts: twice a week.

PHYSICS.

Methods of research in physics, with laboratory work : twice a week.

MATHEMATICS AND ASTRONOMY.

Selections from the subjects named in the plan of study for the degree of master of arts : twice a week.

PRACTICAL ASTRONOMY.

Selections from the subjects named in the plan of study for the degree of master of arts, with work in the observatory.

CHEMISTRY.

Medical chemistry, with laboratory work : daily.

Theoretic chemistry : three times a week.

Applied chemistry : twice or four times a week.

Biology and the use of the microscope : twice a week.

GEOLOGY.

Cosmical, physiographic, and historical geology : three times a week.

Economic geology : twice a week.

MINERALOGY.

Practical mineralogy, with determination of specimens : twice a week during the first term, with blow-pipe analysis twice a week during the second term.

Blow-piping : twice a week for one term.

Crystallography : twice a week for one term.

ADMISSION.

Bachelors of arts, bachelors of science, and bachelors of philosophy of this college or of any other college in good standing, may be admitted to the Graduate Department as students on exhibiting their diplomas to the president, and presenting to him such other testimonials as he may require.

Any such student may attend a single course or any number of courses which he may elect to pursue. He may also, at his option, enter himself as a candidate for the degree of master of arts, subject to the conditions hereinbefore stated.

No student entering at the beginning of the year will be received for a less period than an entire year, and no student entering later will be received for a less period than the entire remaining portion of the year current.

TIME OF ENTRANCE.

Students intending to join the Graduate Department may enter their names with the president on the Monday before commencement day in June, or on the Friday next before the opening of scholastic exercises in October.

It is not advantageous to the student to enter after the beginning of the year; but in case applications are made later, the president may in his discretion receive or refuse the applicant. In all cases the judgment of the instructor in the course which it is desired to enter will be consulted.

No student already a member of the Graduate Department will be allowed to enter upon a new course after the year is advanced, without the consent of the president and of the instructor in such course.

TUITION FEES.

For a single course of one hour per week throughout the year, a fee of twenty-five dollars is required, payable on admission. For a greater number of hours, the fee is twenty-five dollars additional for each additional hour per week up to six; beyond which limit the student may attend any number of hours he pleases without further charge.

In any case in which the total annual fee payable is less than one hundred dollars, payment is required in full at entrance; if the amount is one hundred dollars or more, the payment may be made in two equal instalments, the first payable on the first Monday in October, and the second on the first Monday in February.

Any candidate for a degree in the Graduate Department must pay a fee of \$150, without regard to the number of hours of weekly attendance.

ACADEMIC TERMS.

The academic terms for graduate students correspond to those for undergraduates. There are two terms in the year: the first extends from the first Monday in October to the Saturday before the last Monday in January; the second

extends from the Thursday after the first Monday in February to commencement day, which is the second Wednesday in June.

Lectures are discontinued during holidays in the college, and during the college intermediate examination, which begins on the last Monday in January and continues ten days.

EXAMINATIONS.

An examination of graduate students who are candidates for higher degrees is held annually, commencing on the Monday of the third week before commencement day; at which time lectures are discontinued for the year.

Graduate students who are not candidates for degrees are not required to attend the examination, but may do so at their option; and in such case they may receive such testimonials of proficiency as the result of the examination may justify.

LIBRARY.

Graduate students are entitled to the use of the college library.

DEGREES.

I. Students in the Graduate Department who fulfil the following conditions will be recommended to the Board of Trustees for the degree of doctor of philosophy;

1. Each candidate shall pursue, for the term of at least two academic years, a course of higher study, in the Graduate Department and under the direction of the faculty, in three or more cognate departments of study, and shall pass an approved examination thereon.

Before coming up for examination, the candidate must produce certificates from the heads of the departments in which he has pursued his graduate studies, that he has been regular in attendance and faithful in the work assigned.

2. He shall also present an acceptable thesis or dissertation embodying the results of special study, research, or observation, upon a subject previously approved by the officers of instruction with whom he has studied.

Candidates for the degree of doctor of science or doctor of letters will be held to the same conditions as those above noted for the degree of doctor of philosophy.

II. Students in the Graduate Department, who fulfil the following conditions, will be recommended to the Board of Trustees for the degree of master of arts:

Each candidate shall pursue, for the term of at least one academic year, a course of higher study in the Graduate Department and under the direction of the faculty, in three or more cognate departments of study, and shall pass an approved examination thereon.

Before coming up for examination, the candidate must produce certificates from the heads of the departments in which he has pursued his graduate studies, that he has been regular in attendance and faithful in the work assigned.

III. Persons not candidates for a degree, whether graduates or not, may attend any of the graduate courses for which they may be qualified, upon payment of the proper fees.

Candidates for the degrees of master of arts and doctor of philosophy must give a month's notice to the professors who are to conduct the examinations, and must arrange with them the day, the hour, and the exact subject of such examination.

CALENDAR.

- 1887—May 31.—Examinations for admission begin, Tuesday.
Sept. 26.—Examinations for admission begin, Monday.
Oct. 3.—First term 134th year begins, Monday.
Nov. 8.—Election day, holiday.
Nov. —Thanksgiving day, holiday.
Dec. 26.—Christmas recess begins, Monday.
1888—Jan. 7.—Christmas recess ends, Saturday.
Jan. 30.—Intermediate examinations begin, Monday.
Feb. 8.—First term ends, Wednesday.
Feb. 9.—Second term begins, Thursday.
Feb. 15.—Ash Wednesday, holiday.
Feb. 22.—Washington's birthday, holiday.
Mar. 30.—Good Friday, holiday.
Apr. 2.—Easter Monday, holiday.
May 21.—Concluding examinations begin, Monday.
June 4.—Examinations for admission begin, Monday.
June 13.—Commencement, Wednesday.

COLUMBIA COLLEGE

SCHOOL OF MINES

COURSES OF STUDY, ADMISSION, ETC.

GENERAL STATEMENT.

The system of instruction includes seven parallel courses of study, viz.:

- I. Mining Engineering.
- II. Civil Engineering.
- III. Metallurgy.
- IV. Geology and Palæontology.
- V. Analytical and Applied Chemistry.
- VI. Architecture.
- VII. Sanitary Engineering.

At the beginning of the first year, each student must elect which of the seven courses he intends to pursue, and must thenceforth abide by his election unless permitted by the faculty to make a change.

No student is permitted to pursue a special or partial course.

No student is allowed to pursue more than one course at a time.

The plan of instruction includes lectures and recitations in the several departments of study; practice in the chemical, mineralogical, blowpipe, and metallurgical laboratories; field and underground surveying; practice and study in mines, mills, machine shops, and foundries; projects, estimates and drawings, for the working of mines and for the construction of metallurgical, chemical, and other works; reports on mines, industrial establishments, and field geology.

The course of instruction occupies four years.

There is an advanced course for graduates.

The method of instruction is such that every pupil may acquire a thorough theoretical knowledge of each branch, of which he is required to give evidence, at the close of the session, by written and oral examinations. At the com-

mencement of the following year he is required to show, from reports of works visited, that he understands not only the theoretical principles of the subjects treated, but also their practical application—a point that is insisted on with great rigor.

ADMISSION.

Candidates for admission to the first class, at its formation, must be of the age of eighteen years, complete ; and for admission to advanced standing, there will be required a corresponding increase of age.

Candidates for the first class must pass a satisfactory examination—

In arithmetic, including the metric system of weights and measures.

In geometry, on the nine books of Davies' *Legendre*.

In algebra, on the first ten chapters of Peck's *Manual of Algebra*.

In physics, on the equivalent of Ganot's smaller treatise (Peck's *Ganot's Natural Philosophy*).

In chemistry of the non-metallic elements, on the equivalent to what is contained between pages 131 and 274 in Fownes' *Manual of Chemistry*, 12th edition.

In German, on the general principles of the German grammar, including an ability to read easy German.

In French, on the general principles of French grammar, including an ability to read easy French.

In English grammar, on the equivalent of Quackenbos's *English Grammar*.

In composition and rhetoric, on the equivalent of Quackenbos's *Course of Composition and Rhetoric*.

In history, on the equivalent of Thompson's *History of England* and Doyle's *History of the United States* as contained in Freeman's *Historical Course for schools*.

In physical geography, on the equivalent of Guyot's *Physical Geography*.

In free-hand drawing, including the ability to sketch, both in outline and with proper shading, ordinary objects, such as a tree, a house, a simple piece of machinery, a piece of flat ornament from a copy, a group of geometrical solids, etc.

In book-keeping, on a knowledge of double entry so far as relates to the keeping of ordinary accounts in cash-book, day-book, and ledger, and the making out of corresponding balance sheets.

An applicant may, at the appointed entrance examina-

tions of one year, be examined in portions of the above subjects that are *complete* in themselves, *e. g.*, arithmetic, algebra, or geometry, composition and rhetoric, English grammar, history, etc., and finish his examinations in the requirements for admission at the entrance examinations of the year following.

Graduates of colleges presenting a diploma for the bachelor's degree will not be held to examinations for chemistry, English grammar, composition and rhetoric, admission upon arithmetic, algebra, geometry, trigonometry, American and English history, and physical geography.

Graduates and students of colleges and schools of science, who shall have completed so much of the course as shall be equivalent to the requirements for admission, may be admitted at the beginning of the second year, or earlier, without examination, on presenting diplomas or certificates of good standing and honorable dismissal *satisfactory to the examining officers*.

Candidates for advanced standing must pass a satisfactory examination upon the studies named above, and also upon those pursued by the class which they propose to enter. For particulars as to the requirements for advanced standing in each of the courses, see synopsis of studies, p. 82.

Candidates for admission after the opening of a term will be required to pass satisfactory examinations on the part of the course already gone over by the class for which they are applicants.

No candidates are admitted later in the course than the beginning of the third year.

The regular examinations for admission are held annually, beginning on the Friday before commencement, and on the Tuesday preceding the first Monday in October. Candidates will, however, be examined during the session, but not in vacation.

FEES AND NECESSARY EXPENSES.

1. Each student must pay a fee of five dollars before matriculation in each year, and such fee must be paid by the applicant for admission before examination; and in case the examination is held at a time not appointed in previous public announcements, the fee required is ten dollars.

In the case of an applicant who completes his examination for admission at the appointed entrance examina-

tions of two successive years, but one fee of five dollars is required.

2. The annual tuition fee is two hundred dollars, payable one half on the first day of each session.

3. Every student admitted to an extra examination, in anticipation of the time regularly appointed, or in consequence of failure to attend or to perform satisfactorily at any intermediate or concluding annual examination throughout the course, is required to pay a fee of five dollars before being admitted to such examination.

4. Every candidate for the degree of engineer of mines, or for the degree of civil engineer, or metallurgical engineer, or bachelor of philosophy, or bachelor of architecture, is required to pay a fee of twenty-five dollars before being admitted to the final examination.

5. Every candidate for the degree of doctor of philosophy is required to pay a fee of thirty-five dollars before entering the examination for such degree.

(4 and 5 are not applicable to students who entered the school prior to January 1, 1883, but such students are held to the payment of five dollars for a diploma.)

6. The necessary expenses of a student are—

Board, including room-rent, fire and light, and washing, from \$6.50 to \$10 per week.

Matriculation fee, \$5.

Annual tuition fee, \$200.

Text-books about \$15 for the first class, \$30 for the second class, \$50 for the third class, and \$20 for the fourth class.

Drawing materials \$15 to \$25 for each of the first and second classes, and \$5 to \$10 for each of the others.

Laboratory apparatus (for students who take laboratory courses), \$30 to \$60 for each of the four years.

During the vacation at the close of the second year, travelling and board for summer class in field surveying (for students in the courses of engineering, metallurgy, and geology), \$60 to \$80.

During the vacation at the close of the third year, travelling and board for summer class in practical mining (for students in the courses of mining engineering and metallurgy), \$75 to \$100, and for summer class in practical geodesy (for students in the course of civil engineering), \$60 to \$80.

Graduation (final examination), \$25, or diploma, \$5.

7. The fees required of graduates of the school, attending the school, but not candidates for a degree, are as follows :

1. Matriculation fee	\$5
2. Full fee, entitling the student to all the privileges of the school, per annum	150
3. For the use of the cabinets	25
4. For attendance on lecture-room and other special instruction, per annum for each hour per week of such instruction	25
Or for any number of hours per week as above specified	150
5. For the use of the drawing academy	25
6. For the use of the laboratories or either of them	50

Should the amount of fees, exclusive of the matriculation fee, payable by any student not exceed \$100, the entire amount is payable at the beginning of the academic year, or at the matriculation of the student. Should the amount exceed \$100, payment is required in two equal instalments, one at the beginning of each session of the academic year.

Graduates who are candidates for degrees must pay \$150, irrespective of the number of hours of weekly attendance, and for examination,

For degree of doctor of philosophy	\$35
For other degrees	25

FREE TUITION.

It is the desire of the trustees to extend, as widely as possible, the educational advantages of the college to deserving young men. Free tuition is therefore offered to such, under the conditions specified below.

Candidates for free tuition must fulfil the following conditions:

1. The applicant must present a certificate from some person or persons of good repute, stating—

That his circumstances are such that he cannot pay the tuition fee;

That he is of good moral character and studious habits;

That the writer is not a relative.

A proper blank will be furnished on application to the registrar.

2. He must exhibit a proficiency in every subject of examination for admission expressed by the number 6 of a scale of which 10 is the maximum. (Conditioned students will not receive free tuition.)

3. He must maintain, subsequent to his admission, a

standing in scholarship in every department of study expressed by the number 7, or an average standing in all departments expressed by the number 8, of a similar scale, with no deficiency in any department, failing which he will forfeit his privilege. He will also forfeit his privilege should he be found deficient in any department at the end of the year.

4. Free students are not exempt from the payment of the fees for matriculation, for extra examinations, and for graduation.

APPARATUS SUPPLIES.

I. Students may purchase apparatus of any of the dealers in the city.

II. To avoid inconvenience and expense to the students, and to secure a proper selection, the school undertakes, at considerable trouble and expense, to lend apparatus on the following conditions :

1. Each student engaged in laboratory work must make a deposit of \$40 with the registrar, which deposit will be credited to him on the ledger.

2. Each such student will be entitled, on presenting his receipt at the apparatus room, to draw the regular set of apparatus for qualitative, quantitative, or organic analysis, or for assaying, according to his deposit, and from time to time to obtain ordinary articles which he may need, and these will be charged to him. At the end of the session he will be credited with those articles which he returns in good order, and the value of those which he has injured or broken will be deducted from his deposit.

3. The apparatus room will be open for issuing apparatus every day at convenient hours.

4. No charge is made for ordinary chemicals.

EXCURSIONS.

During the session, the students may visit the different machine shops and metallurgical establishments of the city and its environs.

During the vacations, each student is expected to visit mines, metallurgical and chemical establishments, and, with the exception of students in the courses of engineering and metallurgy of the third class, and students in the course of metallurgy in the fourth class, each is expected to hand in, on his return, a memoir on some subject assigned him. He

is also required to bring collections illustrating his memoir, which collections are placed in the museum, reserved as a medium of exchange, or made use of in the laboratories.

During the latter part of the vacation at the close of the second year, students in the courses of mining and civil engineering, metallurgy, geology, and sanitary engineering are required to join the summer class in surveying under the direction of the adjunct-professor of surveying and practical mining.

During the vacation following the close of the second year, students in the courses of engineering may join a volunteer class in practical mechanical engineering under the supervision of the adjunct-professor of mechanical engineering.

During the vacation following the close of the third year, students in the courses of mining engineering and metallurgy are required to visit mines and engage in actual work or study under the superintendence of the adjunct-professor of surveying and practical mining.

During the vacation following the close of the third year, students in the course of civil engineering are required to attend a summer class in geodesy for six weeks. The class is under the supervision of the professor of geodesy and practical astronomy.

SCHOLASTIC YEAR.

The year is divided into two sessions: the first commences on the first Monday in October; the second, on the first or second Thursday of February. The lectures close on the Friday of the fourth week before commencement.

EXAMINATIONS.

There are two examinations every year, one commencing on the last Monday in January, and the other on the Monday of the third week preceding commencement. The latter is the final examination in each department of all the classes for the year. The former embraces such subjects only as have been completed during the first session.

In addition to the examinations above noted, examinations are held monthly in all the classes, and in every department, for the purpose of ascertaining the proficiency of the students in their respective studies.

COMMENCEMENT AND VACATION.

The annual commencement is held on the second Wednesday in June, on which occasion degrees are publicly conferred.

A vacation of all the classes extends from the day of commencement until the first Monday in October, on which latter day the regular course of study commences.

The exercises of the school are suspended on Ash Wednesday, on Good Friday, on Easter Monday, on public holidays established by law, on such days in each year as may be recommended by the civil authorities to be observed as days of fast or thanksgiving, and for two weeks from the third (or fourth) Monday in December.

NOTE.—To render unnecessary many inquiries addressed to the registrar, it is here stated that there are no dormitories attached to the school. There are no examination papers for distribution.

BY-LAWS.

ENTRANCE CONDITIONS.

1. Students admitted conditionally must satisfy all conditions within two months of the date of their admission, unless the time be extended by vote of the faculty.
2. Students who fail to satisfy their entrance conditions within the time specified will be dropped from the roll.

ATTENDANCE.

3. Prompt attendance is required upon all the exercises of the school. Each instance of tardiness will be counted as half an absence.
4. Attendance during all the hours specified on the scheme of attendance adopted by the faculty is obligatory.
5. Any student who shall have been absent from more than ten per cent. of the exercises in any subject, shall not be entitled to examination in that subject.
6. Any student who, being present at the school, shall absent himself from any exercise, or shall leave the grounds during the hours at which his attendance is due, shall be liable to removal from the roll of his class.
7. Students are required to attend all the exercises and pass all the examinations of the class and course to which they belong, unless specially excused by vote of the faculty.
8. By special permission of the faculty, students may attend exercises not required in the class or course to which they belong, provided that such attendance does not interfere with the required exercises of their class and course. Such students are held to the same rules of attendance and examination in the extra studies as in the required studies of their class and course.
9. Students who obtain on examination a mark of eight or more in any subject, may be excused from attendance upon the exercises in that subject. This rule to apply to new

students and also to those who repeat the studies of any year. Reports of such standing must be filed with the dean of the faculty, who alone is authorized to excuse students from attendance.

10. Any student who shall have passed a satisfactory examination in the School of Arts of Columbia College in any study forming a part of the regular course in the School of Mines, will not be required to pursue that study in the school.

EXAMINATIONS.

11. Examinations will be held each month on all subjects taught in the school.

12. Examinations will be held at the end of the first term (semi-annual), or at the end of the year (annual), on all subjects taught in the school.

13. Any student found guilty of fraudulent practices at examination will be summarily dismissed from the school.

14. No student who absents himself from a regular examination is allowed to proceed with his class without a special vote of the faculty.

15. Any student who shall fail to pass in any of his studies at the regular semi-annual or annual examination, may present himself for a second examination during the last week of the summer vacation. Failing to pass in this second examination, his name will be dropped from the roll of his class; but he may enter the succeeding class, and present himself with that class for a third examination, failing in which his name will be dropped from the roll of the school.

16. Examinations at times other than here designated are not held except by order of the faculty.

17. No student deficient in mathematics will be permitted to go on with his class.

18. No student pursuing the course of analytical and applied chemistry, deficient in any chemical subject, will be permitted to go on with his class.

19. Students deficient in any other department will not be allowed to go on with their classes without a special vote of the faculty.

20. Deficient students of the second or third year will not be allowed to attend any summer school without special permission of the faculty.

21. No student is entitled to a degree until he has passed satisfactory examinations in all the studies of the course in which he desires to graduate.

22. When a student fails to receive his degree with his class, and returns at some later period to present himself for examination for the same, he will be required to comply with all the requirements at the later date, and the same rule shall apply to students who have received one degree and make application for another.

STANDING.

23. Every officer keeps a record of the scholarship of each student.

24. The maximum mark is ten in each department, and six is required to pass a student.

25. Free students must maintain a standing of seven in every branch of study, or a general average of eight in all branches, with no deficiency in any department, failing which they will forfeit their privileges.

CHANGE OF COURSE.

26. No student shall be permitted to change his course till he has passed in every study of the course which he proposes to leave.

ANALYSES.

27. Analyses and assays must be made on material supplied or authorized beforehand by the instructor in charge of the laboratory, and the reports must be handed in on the completion of the work.

28. Students pursuing the course of analytical and applied chemistry, and in the course of metallurgy, are required to complete the regular list of analyses within the time allotted, and failing in this, they are not permitted to continue with their class.

MEMOIRS.

29. Each student, at the commencement of his second, third, and fourth year, is required to present memoirs on such subjects as may be assigned to him by the faculty, except students in the course of metallurgy, who are not required to write a memoir during the vacation at the end of the third year.

30. Students of the second, third, and fourth classes who fail to hand in the memoirs, drawings, and other summer work required of them under the rules by a specified time, shall be liable to be dropped from the roll of their respective classes. The time specified for engineering memoirs and

the work of the summer class in practical mining, is the second Monday in October in each year; for the surveying maps and computations, November 15th; and for other memoirs and summer work, the time specified is November 1st.

PROJECTS AND DISSERTATIONS.

31. Each student, before graduating, is required to execute projects or dissertations on subjects assigned to him by the faculty. These projects or dissertations must be illustrated by drawings made to a scale.

32. All memoirs, projects, dissertations, and drawings executed in the drawing academy may be retained by the school.

DEGREES.

33. Every student who has passed satisfactory examinations in all the studies of a course, and completed the required number of projects, dissertations, memoirs, analyses, assays, and drawings, is recommended to the Board of Trustees for the degree of engineer of mines, civil engineer, metallurgical engineer, or bachelor of philosophy.

34. Graduates of the school, who fulfil the following conditions, are recommended to the Board of Trustees for the degree of doctor of philosophy.

(1) Each candidate shall pursue, for the term of at least one academic year, a course of higher study at the school and under the direction of the faculty, in two or more branches of science, and shall pass an approved examination thereon.

(2) He shall also present an acceptable thesis or dissertation embodying the results of such special study, research, or observation, upon a subject previously approved and accepted by the faculty.

In special cases, and for reasons connected with the work which may be satisfactory to the faculty, the faculty of the school is empowered to grant permission to candidates for the degree of doctor of philosophy to perform their work away from the school, provided that such candidates matriculate at the school as graduate students, and pay the same fees as are required of resident candidates for the same degree.

SPEAKERS AT COMMENCEMENT.

35. A list of members of the graduating class, from whom the speakers at commencement may be chosen, will be made

by the faculty and submitted to the class, who may select as speakers two of the number, subject to the approval of the faculty.

LIBRARY.

36. The library is open to students from 8 A.M. to 10 P.M. daily (except Sundays and Good-Friday), throughout the year, including all holidays and vacations.

37. Books taken from the library must be returned within two weeks, or earlier if recalled by the librarian as specially needed.

38. Students must give receipts for books taken, and are responsible for their return in good condition.

See article "Library," for further notes.

THE LABORATORIES AND DRAWING ACADEMIES.

39. No student will be allowed in a laboratory or a drawing academy at a time when his attendance there is not due. During hours assigned for practical work in each of the laboratories and in the drawing academies, the attendance of students will be required. A record of the daily attendance and of the progress of each student will be kept by the officer in charge.

ORDER.

40. Good order and gentlemanly deportment are required of all students, as a condition of attendance upon the exercises of the school.

41. Smoking is prohibited in the college buildings.

SYNOPSIS OF STUDIES.

FIRST YEAR.

During the first year the instruction to all the students of the school is the same, except that students pursuing the course of civil engineering or the course of architecture are not required to attend the exercises in qualitative analysis, either theoretical or experimental, and students in the course of analytical and applied chemistry only are required to pursue organic chemistry and chemical physics.

FIRST SESSION.

Geometry—volumetric and spherical ; conic sections ; text-books : Davies' Legendre and Peck's Conic Sections.

Algebra—text-book : Peck's Manual of Algebra.

Physics—doctrines of heat, viz., expansion, conduction, radiation, thermometry, latent heat, tension of vapors, steam, specific heat. Optics—lectures, and Atkinson's Ganot's Physics.

Chemistry—the metals. Lectures and recitations ; Fownes' Manual of Chemistry.

Qualitative analysis—lectures, and Fresenius's Manual of Qualitative Analysis.

Drawing—free-hand and sketching ; lettering, instrumental drawing ; projections, intersections, and developments. Text-book : Binn's Orthographic Projection.

SECOND SESSION.

Trigonometry and mensuration, as contained in Davies' Legendre.

Physics—magnetism, electricity, static and dynamic, thermo-electricity, induction, magneto-electricity, the electric telegraph. Optics—lectures, and Atkinson's Ganot's Physics.

- Chemistry—organic; lectures and recitations; Fownes' Manual of Chemistry.
 Chemical physics—lectures and recitations; Cooke's Chemical Physics.
 Qualitative analysis—lectures, and Fresenius's Manual of Qualitative Analysis.
 Drawing—same as first session.

SUMMER VACATION.

Memoir.

I.—COURSE IN MINING ENGINEERING.

SECOND YEAR.

FIRST SESSION.

- Analytical geometry—text-book: Peck's Analytical Geometry.
 Graphics—descriptive geometry; text-book: Church's Descriptive Geometry.
 Botany—lectures, and Gray's Botanical Text-Book.
 Zoölogy—lectures, and Nicholson's Manual of Zoölogy.
 Applied chemistry—lectures and recitations; Wagner's Chemische Technologie—air, water, artificial illumination, photography.
 Blowpipe analysis—qualitative; text-book: Plattner's Blowpipe Analysis.
 Drawing—topographical drawing; tinting and grading; problems in graphics; scale-construction drawing.

SECOND SESSION.

- Differential and integral calculus—text-book: Peck's Practical Calculus.
 Graphics—shades and shadows, perspective, isometrical drawing; text-book: Church's Shades and Shadows.
 Botany—lectures, and Gray's Botanical Text-Book.
 Zoölogy—lectures, and Nicholson's Manual of Zoölogy.
 Applied chemistry—lectures and recitations; Wagner's Chemische Technologie—limes, mortars, and cements; building stones: decay and preservation; timber and its preservation; pigments, paints, essential oils, varnishes; glass and ceramics; explosives: gunpowder, gun-cotton, nitro-glycerine; electro-metallurgy, etc.

Crystallography—lectures, and Egleston's Diagrams of Crystals.

Drawing—construction drawing; mine maps; mine sections.

SUMMER VACATION.

Optional class in machine shops.

Surveying—lectures, recitations, and field work; pacing; compass and chain surveys; topographical work; use of solar compass in land and mineral surveys; adjustments and use of transit and wye level for triangulation; traversing, city surveying, and levelling; use of plane table; stratigraphical and magnetic surveys.

(Summer class in surveying.)

THIRD YEAR.

FIRST SESSION.

Mechanics of solids, including forces, moments, equilibrium, stability, etc., and elementary machines; dynamics, including uniform, varied, rectilinear, and curvilinear motion, rotation, vibration, impact, work done, etc.

Physics—mechanical theory of heat, electricity.

Engineering—general principles relating to materials and structures, physically and mechanically considered.

1. Materials—stone, cements, brick, metals, timber, treated in regard to strength, durability, mode of preparation, defects, tests of quality, and fitness for special uses.
2. Structures—earthwork, execution of earthwork, foundations and supports, superstructure, joints; stability, strength, and stiffness of parts; special rules of construction for masonry of public buildings, bridges, retaining walls, arches, railroads, common roads, and canals.

Physical properties of materials—pig-iron: castings, chilled and malleable; wrought iron: bar, shapes, plate, tube, and wire; steel: ingot metal, castings, shapes, and plate; other metals and alloys.

Practical mining—excavation, quarrying, drilling and blasting, tunnelling.

Assaying and ore testing—lectures, recitations, and practical work.

Metallurgy—general metallurgy ; fuel, furnaces, etc.

Mineralogy—determinative.

Geology, lithological—rocks and rock masses.

Drawing—general engineering construction ; machine construction.

SECOND SESSION.

Mechanics of fluids, including pressure, buoyancy, and specific gravities, motion in pipes and channels, undulation, capillarity, tension and elasticity of gases, the atmosphere, the barometer, barometric formulæ, and hypsometry.

Physics—electricity, physical optics, and the undulatory theory of light (last two optional).

Engineering—theory of strains and strength of materials—elasticity, mechanical laws, application of principles of mechanics to beams, girders, and roof trusses under various conditions of loading and supports.

Physical properties of materials—continued from first session.

Practical mining—excavation, quarrying, drilling and blasting, tunnelling.

Metallurgy—iron and steel.

Mineralogy—determinative.

Geology—historical, including palæontology, or a systematic review of recent and fossil forms of life.

Drawing—general engineering construction ; machine construction.

SUMMER VACATION.

Summer class in practical mining.

Memoir.

FOURTH YEAR.

(Without distinction of sessions.)

Mining engineering—

1. Considered in its widest sense as a course of study.
2. Considered in reference to the application of general principles of engineering to the development and working of mines.
3. Classification and nomenclature of mineral deposits ; descriptions of lodes or veins, beds, masses, and irregular deposits, with illustrations of the disturb-

- ances to which they are subjected, as affecting the work of mining.
4. Graphical representation of deposits ; with examples showing modes of occurrence and disturbances.
 5. Prospecting or searching for mineral deposits.
 6. Exploratory workings.
 7. Establishing seats of extraction.
 8. Description of typical methods of exploitation as applied to wide veins or lodes, to narrow veins, masses, to beds of various thicknesses and degrees of inclination.
 9. General principles relating to subterranean transportation.
 10. Methods and machinery employed for extracting minerals from the pits, and for facilitating ascent and descent of workmen.
 11. Drainage of mines ; theory of infiltrations of water, methods and machinery for draining or freeing mines from water.
 12. Ventilation of mines ; causes of vitiation of the air of mines ; quantities of fresh air required under various circumstances ; natural ventilation ; mechanical ventilation by fires and by ventilating machinery ; distribution of air through galleries and workings.
 13. Graphical illustrations of exploratory workings ; methods of exploitation ; machinery for hoisting, pumping, ventilation, and transportation, including the use of steam-engines and pumps, air compressors, air engines, pumping engines, winding engines, centrifugal and other ventilating machines.

Engineering—theory of strains and strength of materials continued ; graphical methods of determining strains, deflection of beams and girders ; quantity of material in braced girders under various conditions of loading and supports ; angle of economy for bracing ; torsion of shafts ; crushing and tensile strength of materials ; working strains and working load ; mode of estimating cost of girder work.

Dynamics of machinery—forces of nature employed or acting in all machines ; dynamical laws, mathematical theorems, measure of forces, work of forces ; elementary machines and their combinations ; theory of efficiency ; theory of fly-wheels, governors, and brakes ; strength and proportions of parts of machines ; dyna-

mometers; prime movers, as driven by animal power, water power, steam power, compressed or heated air, wind power, comprising the theory of animal power, theory of water-wheels, overshot wheels, undershot wheels, breast wheels, turbines, reaction wheels, centrifugal pumps; properties and laws of heat as applied to the generation of steam and the construction of boilers; properties of steam and air in their relation to prime movers; mechanical theory of heat applied to steam-engines, hot-air engines, compressed-air engines; general description of heat engines of various forms; description and theory of ventilating fans or blowers.

Hydraulic engineering—application of principles of mechanics of fluids to determining the discharge of water over weirs or dams; the dimensions of conduit pipes; discharge of canals and rivers; the effect of varying forms and sections of channels and of obstructions to flow; the gauging of streams; retaining walls for reservoirs.

Mechanical engineering—

1. Steam-boilers—construction, wear and tear, fittings, setting, testing, care and management, firing, feeding, injectors, pumps, etc.
2. Mechanism of engines—valve gearing, link motions, governors, etc.
3. Management of engines—erecting, emergencies, special types of engines, etc.
4. Proportions of engines, etc.
5. Testing efficiency of engines and boilers, etc.
6. Pumps, hoisting engines, ventilating machinery, construction and management of hot-air, gas, and petroleum engines, etc.
7. Machine tools.

Kinematics of machinery—

1. General theory of motion.
2. Uniform and varied motion.
3. Composition of motions.
4. Instantaneous centre and centroids.
5. Transmissions by rolling and sliding contact, by belting, ropes and chain, by shafting and linkages, by fluids.
6. Engaging and disengaging and reversing gears, and quick-return motions.

Graphical statics.

Surveying—railroad surveying, reconnoissance, location of line, calculation of cuttings and embankments.

Practical mining—

1. Boring, earth augers, driven wells, boring with rods and cable tools; upward, inclined, and horizontal boring; diamond drill and its use in prospecting.
2. Shaft sinking, shaft timbering and spiling, boring of shafts, sinking of iron and masonry linings, cribbing, walling, and tubbing.
3. Drifting of adits and levels, timbering and walling in levels and working places.
4. Mining of coal and ores, coal-cutting machines, hand and machine drilling.
5. Handling of coal and ores in working places.
6. Trammings, cars, tracks, locomotive and wire-rope haulage, planes and gravity roads.
7. Accidents to miners, cause and prevention.
8. Organization and administration.
9. Time-books, measurement of contracts, pay-roll, analysis and dissection of accounts and cost sheets.

Ore dressing—

1. Introduction, theory of separation, hand and machine dressing, general principles governing crushing and sizing of ores of different character.
2. Jigging—theory of, description of different forms of jigs and methods of working, air jigs.
3. Slime treatment, classification of slimes in troughs, spitz kasten, etc., and treatment on buddles and tables.
4. Description of crushing machinery, jaw crushers, rolls, stamps, mills, etc.
5. Sizing apparatus, screens, riddles, and trommels.
6. Description of coal-washing plant; anthracite breaker.
7. Description of American ore-dressing works.
8. Foreign ore-dressing works.

Quantitative analysis—optional.

Metallurgy—copper, lead, antimony, silver, gold, zinc, tin, mercury, etc.

Economic geology—theory of mineral veins, ores, deposits and distribution of iron, copper, lead, gold, silver, mercury, and other metals; graphite, coal, lignite, peat, asphalt, petroleum, salt, clay, limestone, cements, building and ornamental stones, etc.

Drawing—engineering, designing.

Project in metallurgy, or thesis in mining engineering or economic geology.

II.—COURSE IN CIVIL ENGINEERING.

SECOND YEAR.

FIRST SESSION.

- Analytical geometry—text-book : Peck's Analytical Geometry.
- Graphics—descriptive geometry ; text-book : Church's Descriptive Geometry.
- Botany—lectures, and Gray's Botanical Text-Book.
- Zoölogy—lectures, and Nicholson's Manual of Zoölogy.
- Applied chemistry—lectures and recitations ; Wagner's Chemische Technologie—air, water, artificial illumination, photography.
- Blowpipe analysis—qualitative ; text-book : Plattner's Blowpipe Analysis.
- Drawing—topographical drawing ; tinting and grading ; problems in graphics ; scale-construction drawing.

SECOND SESSION.

- Differential and integral calculus—text-book : Peck's Practical Calculus.
- Graphics—shades and shadows, perspective, isometrical drawing.
- Stereotomy—text-book : Mahan's Stone-Cutting.
- Botany—lectures, and Gray's Botanical Text-Book.
- Zoölogy—lectures, Nicholson's Manual of Zoölogy.
- Applied chemistry—lectures and recitations ; Wagner's Chemische Technologie—limes, mortars, and cements ; building stones : decay and preservation ; timber and its preservation ; pigments, paints, essential oils, varnishes ; glass, and ceramics ; explosives : gunpowder, gun-cotton, nitro-glycerine ; electro-metallurgy, etc.
- Crystallography—lectures, and Egleston's Diagrams of Crystals.
- Drawing—problems in graphics ; construction drawing ; stone-cutting.
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SUMMER VACATION.

- Optional class in machine shops.
- Surveying—lectures, recitations, and field work ; pacing ; compass and chain surveys ; topographical work ; use of solar compass in land surveys ; adjustments and use of

transit and wye level for triangulation ; traversing, city surveying, and levelling ; use of plane table ; hydrographic surveys.

(Summer class in surveying.)

THIRD YEAR.

FIRST SESSION.

Mechanics of solids, including forces, moments, equilibrium, stability, etc., and elementary machines ; dynamics, including uniform, varied, rectilinear, and curvilinear motion, rotation, vibration, impact, work done, etc.

Physics—mechanical theory of heat, electricity.

Practical astronomy and general principles of geodesy.

Engineering—general principles relating to materials and structures, physically and mechanically considered.

1. Materials—stone, cements, brick, metals, timber, treated in regard to strength, durability, mode of preparation, defects, tests of quality, and fitness for special uses.
2. Structures — earthwork, execution of earthwork, foundations and supports, superstructure, joints ; strength, and stiffness of parts ; special rules of construction for masonry of public buildings, bridges, retaining walls, arches, railroads, common roads, and canals.

Physical properties of materials—pig-iron : castings, chilled and malleable ; wrought iron : bar, shapes, plate, tube, and wire ; steel : ingot metal, castings, shapes, and plate ; other metals and alloys.

Sanitary Engineering—drainage of buildings and house-lots ; water supply of buildings.

Practical mining—excavation, quarrying, drilling and blasting, tunnelling.

Metallurgy—general metallurgy ; fuels, furnaces, etc.

Mineralogy—determinative.

Geology—lithological, cosmical, and physiographic.

Drawing—general engineering construction ; machine construction.

SECOND SESSION.

Mechanics of fluids, including pressure, buoyancy, and specific gravities, motion in pipes and channels, undulation, capillarity, tension and elasticity of gases, the

atmosphere, the barometer, barometric formulæ, and hypsometry.

Physics—physical optics and the undulatory theory of light (optional).

Practical astronomy and general principles of geodesy.

Engineering—theory of strains and strength of materials—elasticity, mechanical laws, application of principles of mechanism to beams, girders, and roof trusses under various conditions of loading and supports.

Physical properties of materials—continued from first session.

Sanitary engineering—drainage of buildings and house lots; plumbing and water supply of buildings.

Practical mining—excavation, quarrying, drilling and blasting, tunnelling.

Metallurgy—iron and steel.

Mineralogy—determinative.

Geology—historical, including palæontology.

Drawing—general engineering construction; machine construction.

SUMMER VACATION.

Summer class in practical geodesy.

Memoir.

FOURTH YEAR.

(Without distinction of sessions.)

Civil engineering—hydraulic and sanitary engineering, embracing water supply for cities and towns, for the purposes of irrigation and improvement of lands; quantity and quality of water required; rainfall, flows of streams, storage of water, capacity of water-sheds, impurities of water; practical construction of water-works, pumping machinery; clarification of water; systems of water supply.

Principles of sanitary engineering as regards necessity of sanitary measures, different systems of removing refuse and decomposing matters, warming and ventilation.

Works of sewerage—rainfall and sewers; influence of geological and topographical features of the sites of towns and districts; discharge of sewers; intercepting sewers, forms, modes of construction, and materials used;

flushing of sewers and ventilation; traps, outfalls, tide valves; subsoil and surface drainage of towns; house drainage; water-closets; ventilation of houses in connection with sanitary measures.

Improvements of rivers and harbors—action of tides and currents in forming and removing deposits; methods of protecting and deepening harbors and channels.

Engineering—theory of strains and strength of materials continued—graphical methods of determining strains; deflection of beams and girders; quantity of material in braced girders under various conditions of loading and supports; angle of economy for bracing; torsion of shafts; crushing and tensile strength of materials, working strains and working load; mode of estimating cost of girder work.

Dynamics of machinery—forces of nature employed or acting in all machines; dynamical laws, mathematical theorems, measure of forces, work of forces; elementary machines and their combinations; theory of efficiency; theory of fly-wheels, governors, and brakes, strength and proportions of parts of machines; dynamometers; prime movers as driven by animal power, water power, steam power, compressed or heated air, wind power, comprising the theory of animal power, theory of water-wheels, overshot wheels, undershot wheels, breast wheels, turbines, reaction wheels, centrifugal pumps; properties and laws of heat as applied to the generation of steam in steam boilers; properties of steam and air in their relation to prime movers; mechanical theory of heat, applied to steam-engines, hot-air engines, compressed-air engines; general description of heat engines of various forms; description and theory of ventilating fans or blowers.

Hydraulic engineering—application of principles of mechanics of fluids to determining the discharge of water over weirs or dams; the dimensions of conduit pipes; discharge of canals and rivers; the effects of varying forms and sections of channels and of obstructions to flow; the gauging of streams; retaining walls for reservoirs.

Mechanical engineering—

1. Steam-boilers—construction, wear and tear, fittings, setting, testing, care and management, firing, feeding, injectors, pumps, etc.
2. Mechanism of engines, valve gearing, link motions, governors, etc.

3. Management of engines, erecting, emergencies, special types of engines, etc.
4. Proportions of engines, etc.
5. Testing efficiency of engines and boilers.
6. Pumps, hoisting engines, ventilating machinery.
7. Construction and management of hot-air, gas, and petroleum engines, etc.
8. Machine tools.

Kinematics of machinery—

1. General theory of motion.
2. Uniform and varied motion.
3. Composition of motions.
4. Instantaneous centre and centroids.
5. Transmissions by rolling and sliding contact, by belting, ropes and chain, by shafting and linkages, by fluids.
6. Engaging gears, reversing and quick-return motions.

Graphical statics.

Geodesy continued, with lectures on figure of the earth, astronomical determinations of time, latitude, longitude, and azimuth of a direction.

Railroad engineering—permanent way ; rolling stock ; motive power ; administration, etc.

Surveying—railroad surveying: reconnoissance, location and survey of line with curves and slope stakes, calculations of cuttings and embankments ; railroad construction.

Economic geology—theory of mineral veins, ores, deposits, and distribution of iron, copper, lead, gold, silver, mercury, and other metals ; graphite, coal, lignite, peat, asphalt, petroleum, salt, clay, limestone, cements, building and ornamental stones, etc.

Drawing—engineering designing.

Project.

III.—COURSE IN METALLURGY.

SECOND YEAR.

FIRST SESSION.

Analytical geometry—text-book: Peck's Analytical Geometry.

Graphics—descriptive geometry ; text-book: Church's Descriptive Geometry.

Botany—lectures, and Gray's Botanical Text-Book.

Zoölogy—lectures, and Nicholson's Manual of Zoölogy.

Applied chemistry—lectures and recitations ; Wagner's

- Chemische Technologie—air, water, artificial illumination, photography.
 Quantitative analysis—lectures, and Cairns' Quantitative Analysis.
 Blowpipe analysis—qualitative ; text-book : Plattner's Blowpipe Analysis.
 Drawing—tinting and grading ; topographical drawing ; construction drawing.

SECOND SESSION.

- Differential and integral calculus—text-book : Peck's Practical Calculus.
 Graphics—shades and shadows, perspective, isometrical drawing.
 Stereotomy—text-book : Mahan's Stone-Cutting.
 Botany—lectures, and Gray's Botanical Text-Book.
 Zoölogy—lectures, and Nicholson's Manual of Zoölogy.
 Applied chemistry—lectures and recitations ; Wagner's Chemische Technologie—limes, mortars, and cements ; building stones : decay and preservation ; timber and its preservation ; pigments, paints, essential oils, varnishes ; glass and ceramics ; explosives : gunpowder, gun-cotton, nitro-glycerine ; electro-metallurgy, etc.
 Quantitative analysis—lectures, and Cairns' Quantitative Analysis.
 Crystallography—lectures, and illustrative diagrams.
 Drawing—construction drawing : plans of mill buildings, furnaces, etc.

SUMMER VACATION.

- Optional class in machine shops.
 Surveying—lectures, recitations, and field work ; pacing ; compass and chain surveys ; topographical work ; use of solar compass in land and mineral surveys ; adjustments and use of transit and wye level for triangulation ; traversing, city surveying, and levelling ; use of plane table ; stratigraphical and magnetic surveys.
(Summer class in surveying.)

THIRD YEAR.

FIRST SESSION.

- Mechanics of solids, including forces, moments, equilibrium, stability, etc., and elementary machines ; dynamics, in-

cluding uniform, varied, rectilineal, and curvilinear motion, rotation, vibration, impact, work done, etc.

Physics—mechanical theory of heat, electricity.

Engineering—general principles relating to materials and structures, physically and mechanically considered.

1. Materials—stone, cements, brick, metals, timber, treated in regard to strength, durability, mode of preparation, defects, tests of quality, and fitness for special uses.
2. Structures—earthwork, execution of earthwork, foundations and supports, superstructure, joints; stability, strength, and stiffness of parts; special rules of construction for masonry of public buildings, bridges, retaining walls, arches, railroads, common roads, and canals.

Physical properties of materials—pig-iron: castings, chilled and malleable; wrought-iron: bar, shapes, plate, tube, and wire; steel: ingot metal, castings, shapes and plate; other metals and alloys.

Practical mining—excavation, quarrying, drilling and blasting, tunnelling.

Quantitative analysis.

Metallurgy—general metallurgy, fuels, etc.

Mineralogy—determinative.

Geology—lithological, rocks and rock masses.

Drawing—constructions; machines, furnaces, plans, etc.

SECOND SESSION.

Mechanics of fluids, including pressure, buoyancy, and specific gravities, motion in pipes and channels, undulation, capillarity, tension and elasticity of gases, the atmosphere, the barometer, barometric formulæ, and hypsometry.

Physics—physical optics and the undulatory theory of light (optional).

Engineering—theory of strains and strength of materials continued—graphical methods of determining strains, deflection of beams and girders; quantity of material in braced girders under various conditions of loading and supports; angle of economy for bracing; torsion of shafts; crushing and tensile strength of materials; working strains and working load; mode of estimating cost of girder work.

Dynamics of machinery—forces of nature employed or acting in all machines; dynamical laws, mathematical theorems, measure of forces, work of forces; elementary machines

and their combinations; theory of efficiency; theory of fly-wheels, governors, and brakes; strength and proportions of parts of machines; dynamometers.

Physical properties of materials—continued from first session.

Practical mining—excavation, quarrying, drilling and blasting, tunnelling.

Assaying and ore testing—lectures, recitations, and practical work; sampling and testing large and small lots of ores, slags, mattes, alloys, amalgams, etc.; special practice on lead, antimony, gold, silver, and copper ores.

Metallurgy—iron and steel.

Mineralogy—determinative.

Geology—historical, including palæontology.

Drawing—constructions; machines, furnaces, plans, etc.

SUMMER VACATION.

Summer class in practical mining.

FOURTH YEAR.

(Without distinction of sessions.)

Mining engineering.

1. Considered in its widest sense as a course of study.
2. Considered in reference to the application of general principles of engineering to the development and working of mines.
3. Classification and nomenclature of mineral deposits; descriptions of lodes or veins, beds, masses, and irregular deposits, with illustrations of the disturbances to which they are subjected, as affecting the work of mining.
4. Graphical representations of deposits, with examples showing modes of occurrence and disturbances.
5. Prospecting or searching for mineral deposits.
6. Exploratory workings.
7. Establishing seats of extraction.
8. Description of typical methods of exploitation as applied to wide veins or lodes, to narrow veins, masses, to beds of various thicknesses and degrees of inclination.
9. General principles relating to subterranean transportation.

10. Methods and machinery employed for extracting minerals from the pits, and for facilitating ascent and descent of workmen.
11. Drainage of mines; theory of infiltrations of water, methods and machinery for draining or freeing mines from water.
12. Ventilation of mines; causes of vitiation of the air of mines; quantities of fresh air required under various circumstances; natural ventilation; mechanical ventilation by fires and by ventilating machinery; distribution of air through galleries and workings.
13. Graphical illustrations of exploratory workings; methods of exploitation; machinery for hoisting, pumping, ventilation, and transportation, including the use of steam-engines and pumps, air compressors, air engines, pumping engines, winding engines, centrifugal and other ventilating machines.

Engineering—theory of strains and strength of materials continued—graphical methods of determining strains; deflection of beams and girders; quantity of material in braced girders under various conditions of loading and supports; angle of economy for bracing; torsion of shafts; crushing and tensile strength of materials; working strains and working load; mode of estimating cost of girder work.

Dynamics of machinery—forces of nature employed or acting in all machines; dynamical laws, mathematical theorems, measure of forces, work of forces; elementary machines and their combinations; theory of efficiency; theory of fly-wheels, governors, and brakes; strength and proportions of parts of machines; dynamometers; prime movers, as driven by animal power, water power, steam power, compressed or heated air, wind power, comprising the theory of animal power, theory of water-wheels, overshot wheels, undershot wheels, breast wheels, turbines, reaction wheels, centrifugal pumps; properties and laws of heat as applied to the generation of steam and the construction of boilers; properties of steam and air in their relation to prime movers; mechanical theory of heat applied to steam-engines, hot-air engines, compressed-air engines; general description of heat engines of various forms; description and theory of ventilating fans or blowers.

Hydraulic engineering—application of principles of me-

chanics of fluids to determining the discharge of water over weirs or dams; the dimensions of conduit pipes; discharge of canals and rivers; the effect of varying forms and sections of channels and of obstructions to flow; the gauging of streams; retaining walls for reservoirs.

Mechanical engineering—

1. Steam boilers—construction, wear and tear, fittings, setting, testing, care and management, firing, feeding, injectors, pumps, etc.
2. Mechanism of engines—valve gearing, link motions, governors, etc.
3. Management of engines — erecting, emergencies, special types of engines, etc.
4. Proportions of engines, etc.
5. Testing efficiency of engines and boilers, etc.
6. Pumps, hoisting engines, ventilating machinery; construction and management of hot-air, gas, and petroleum engines, etc.
7. Machine tools.

Kinematics of machinery—

1. General theory of motion.
2. Uniform and varied motion.
3. Composition of motions.
4. Instantaneous centre and centroids.
5. Transmissions by rolling and sliding contact, by belting, rope and chain, by shafts and linkages, by fluids.
6. Engaging and reversing gears, and quick-return motions.

Graphical statics.

Surveying—railroad surveying, reconnoissance, location of line, calculation of cuttings and embankments.

Practical mining—

1. Boring, earth augers, driven wells, boring with rods and cable tools, upward, inclined, and horizontal boring, diamond drill and its use in prospecting.
2. Shaft sinking, shaft timbering and spiling, boring of shafts, sinking of iron and masonry linings, cribbing, walling, and tubbing.
3. Drifting of adits and levels, timbering and walling in levels and working places.
4. Mining of coal and ores, coal-cutting machines, hand and machine drilling.
5. Handling of coal and ores in working places.

6. Tramping, cars, tracks, locomotive and wire-rope haulage, planes and gravity roads.
7. Accidents to miners, cause and prevention.
8. Organization and administration.
9. Time-books, measurement of contracts, pay-roll, analysis and dissection of accounts and cost sheets.

Ore dressing—

1. Introduction, theory of separation, hand and machine dressing, general principles governing crushing and sizing of ores of different character.
2. Jigging—theory of, description of different forms of jigs and methods of working, air jigs.
3. Slime treatment, classifications of slimes in troughs, spitz kasten, etc., and treatment on buddles and tables.
4. Description of crushing machinery, jaw crushers, rolls, stamps, mills, etc.
5. Sizing apparatus, screens, riddles, and trommels.
6. Description of coal-washing plant; anthracite breaker
7. Description of American ore-dressing works.
8. Foreign ore-dressing works.

Metallurgy—copper, lead, silver, gold, zinc, tin, mercury, etc.

Economic geology—theory of mineral veins, ores, deposits, and distribution of iron, copper, lead, gold, silver, mercury, and other metals; graphite, coal, lignite, peat, asphalt, petroleum, salt, clay, limestone, cements, building and ornamental stones, etc.

Drawing—project and thesis work.

Project.

IV.—COURSE IN GEOLOGY AND PALÆONTOLOGY.

SECOND YEAR.

FIRST SESSION.

Graphics—descriptive geometry; text-book: Church's Descriptive Geometry.

Botany—lectures, and Gray's Botanical Text-Book.

Zoölogy—lectures, and Nicholson's Manual of Zoölogy.

Applied chemistry—lectures and recitations; Wagner's Chemische Technologie—air, water, artificial illumination, photography.

Blowpipe analysis—qualitative ; text-book : Plattner's Blow-pipe Analysis.

Drawing—topographical drawing ; tinting and grading ; problems in graphics ; sketches of geological outcrops, fossils, etc.

SECOND SESSION.

Graphics—shades and shadows, perspective and isometrical drawing.

Botany—lectures, and Gray's Botanical Text-Book.

Zoölogy—lectures, and Nicholson's Manual of Zoölogy.

Applied chemistry—lectures and recitations ; Wagner's Chemische Technologie—limes, mortars, and cements ; building stones : decay and preservation ; timber and its preservation ; pigments, paints, essential oils, varnishes ; glass and ceramics ; explosives : gunpowder, gun-cotton, nitro-glycerine ; electro-metallurgy, etc.

Crystallography—lectures and illustrative diagrams.

Drawing—geological sections, plain and colored ; fossil drawing.

SUMMER VACATION.

Surveying—lectures, recitations, and field work ; pacing ; compass and chain surveys ; topographical work ; use of solar compass in land and mineral surveys ; adjustments and use of transit and wye level for triangulation ; traversing, city surveying, and levelling ; use of plane table ; stratigraphical and magnetic surveys.

(Summer class in surveying.)

Memoir.

THIRD YEAR.

FIRST SESSION.

Physics—mechanical theory of heat, electricity.

Assaying and ore testing—lectures, recitations, and practical work.

Metallurgy—general metallurgy, fuels, etc.

Mineralogy—determinative.

Geology—lithological, cosmical, physiographic.

Drawing—geological drawings.

SECOND SESSION.

Physics—electricity, physical optics, and the undulatory theory of light (last two optional).

Metallurgy—iron and steel.
Mineralogy—determinative.
Geology—historical, including palæontology.
Drawing—geological drawings.

SUMMER VACATION.

Memoir.

FOURTH YEAR.

(Without distinction of sessions.)

Surveying—principles of geodesy, railroad surveying, reconnaissance, location of line, calculations of cuttings and embankments.
Quantitative analysis—optional.
Metallurgy—copper, lead, silver, gold, zinc, tin, mercury, etc.
Economic geology—theory of mineral veins, ores, deposits and distribution of iron, copper, lead, gold, silver, mercury, and other metals; graphite, coal, lignite, peat, asphalt, petroleum, salt, clay, limestone, cements, building and ornamental stones, etc.
Drawing—dissertation and thesis work.
Thesis.

V.—COURSE IN ANALYTICAL AND APPLIED CHEMISTRY.

SECOND YEAR.

FIRST SESSION.

Botany—lectures, and Gray's Botanical Text-Book.
Zoölogy—lectures, and Nicholson's Manual of Zoölogy.
Applied chemistry—lectures and recitations; Wagner's Chemische Technologie—air, water, artificial illumination, photography.
Chemical philosophy—lectures and recitations; Cooke's Chemical Philosophy.
Quantitative analysis—lectures, and Cairns' Quantitative Analysis.
Blowpipe analysis—qualitative; text-book: Plattner's Blowpipe Analysis.
The use of the microscope and its practical applications—lectures and laboratory practice.

SECOND SESSION.

Botany—lectures, and Gray's Botanical Text-Book.

Zoölogy—lectures, and Nicholson's Manual of Zoölogy.

Applied chemistry—lectures and recitations; Wagner's Chemische Technologie—limes, mortars, and cements; building stones: decay and preservation; timber and its preservation; pigments, paints, essential oils, varnishes; glass and ceramics; explosives: gunpowder, gun-cotton, nitro-glycerine; electro-metallurgy, etc.

Chemical philosophy—lectures and recitations; Cooke's Chemical Philosophy.

Quantitative analysis—lectures, and Cairns' Quantitative Analysis.

Crystallography—lectures, and Egleston's Diagrams of Crystals.

The use of the microscope and its practical application—lectures and laboratory practice.

 SUMMER VACATION.

Memoir.

THIRD YEAR.

FIRST SESSION.

Physics—mechanical theory of heat, electricity.

Applied chemistry—lectures and recitations; Wagner's Chemische Technologie.

Chemical manufactures: acids, alkalies, and salts. (1) Sulphur, sulphurous acid, hyposulphites, sulphuric acid, bisulphide of carbon, etc. (2) Common salt, soda ash, hydrochloric acid, chlorine, binoxide of manganese, bleaching powder, chlorates, chlorimetry, etc. (3) Carbonate of potash, caustic potash, alkalimetry, acidimetry, etc. (4) Nitric acid and nitrates. (5) Iodine, bromine, etc. (6) Sodium, aluminium, magnesium. (7) Phosphorus, matches, etc. (8) Ammonia salts. (9) Cyanides. (10) Alum, copperas, blue vitriol, salts of magnesia, baryta, strontia, etc. (11) Borates, stannates, tungstates, chromates, etc. (12) Salts of mercury and silver. (13) Oils, fats, soaps, glycerine.

Quantitative analysis.

Metallurgy—general metallurgy, fuels, furnaces, etc.
Mineralogy—determinative.
Geology—lithological, cosmical, and physiographic.
Biology—laboratory practice.

SECOND SESSION.

Physics—electricity, physical optics, and the undulatory theory of light (last two optional).
Applied chemistry—lectures and recitations; Wagner's *Chemische Technologie*.
Food and drink : milk, cereals, starch, bread, meat, tea, coffee, sugar, fermentation, wine, beer, spirits, vinegar, preservation of food, tobacco, etc.
Assaying—lectures, recitations, and practical work ; ores of lead, antimony, tin, bismuth, copper, nickle, iron, mercury, gold and silver ; alloys of lead, gold, and silver.
Metallurgy—iron and steel.
Mineralogy—determinative.
Geology—historical, including palæontology.
Biology—laboratory practice.

SUMMER VACATION.

Memoir.

FOURTH YEAR.

(*Without distinction of sessions.*)

Organic chemistry—lectures and laboratory practice.
Applied chemistry—lectures and recitations; Wagner's *Chemische Technologie*.
Clothing: textile fabrics, bleaching, dyeing, calico printing, paper, tanning, glue, india-rubber, gutta-percha, etc.
Fertilizers : guano, superphosphates, poudrettes, etc.
Metallurgy—copper, lead, silver, gold, zinc, tin, mercury, etc.
Economic geology—theory of mineral veins ; ores ; deposits and distribution of iron, copper, lead, gold, silver, mercury, and other metals ; graphite, coal, lignite, peat, asphalt, petroleum, salt, clay, limestone, cements, building and ornamental stones, etc.
Thesis.

VI.—COURSE IN ARCHITECTURE.

SECOND YEAR.

FIRST SESSION.

Analytical geometry—text-book: Peck's Analytical Geometry.

Graphics—descriptive geometry; problems.

The elements of architecture—the forms and proportions of the five orders, and of balustrades, steps, doors, windows, arches, vaults, domes, roofs, spires, etc.

Greek architectural history—text-book: Reber's History of Ancient Art.

Applied chemistry—lectures and recitations; Wagner's Chemische Technologie—air, water, artificial illumination, photography.

Drawing—tracing; ornament; plans, sections, and elevations.

SECOND SESSION.

Differential and integral calculus—text-book: Peck's Practical Calculus.

Graphics—shades and shadows; perspective, isometrical drawing; problems.

Stereotomy—text-book: Mahan's Stone-Cutting.

The elements of architecture, continued.

Roman architectural history.

Applied chemistry—lectures and recitations; Wagner's Chemische Technologie—limes, mortars, and cements; building stones: decay and preservation; timber and its preservation; pigments, paints, oils, and varnishes; glass and ceramics; explosives: gunpowder, gun-cotton, nitro-glycerine; electro-metallurgy, etc.

Drawing—ornament from casts; details; perspective drawings.

SUMMER VACATION.

Surveying—optional.

Memoir.

THIRD YEAR.

FIRST SESSION.

Mechanics of solids, including forces, moments, equilibrium, stability, etc., and elementary machines.

Engineering—general principles relating to materials and structures, physically and mechanically considered.

1. Materials—stone, cements, brick, metal, timber, treated in regard to strength, durability, mode of preparation, defects, tests of quality, and fitness for special uses.
2. Structures—earthwork, execution of earthwork, foundations and supports, superstructure, joints; stability, strength, and stiffness of parts; special rules of construction for masonry of public buildings, bridges, retaining walls, arches.

Sanitary engineering—drainage of buildings and house lots; plumbing and water supply of buildings.

* Mediæval architectural history.

* The history of ornament—lectures and exercises.

The theory of architecture—the theory of form, conventionalism.

* Specifications and working drawings—excavation, foundations, piling, stonework, brickwork, plastering, and stucco-work; lectures; excursions.

Architectural design—design by dictation: problems.

Modelling.

Geology—descriptive.

Drawing from the cast—ornament and the human figure.

SECOND SESSION.

Mechanics of fluids, including pressure, buoyancy, and specific gravities, motion in pipes and channels, undulation, capillarity, tension and elasticity of gases, the atmosphere, the barometer, barometric formulæ, and hypsometry.

Engineering—theory of strains and strength of materials—elasticity, mechanical laws, application of principles of mechanics to beams, girders, and roof trusses under various conditions of loading and supports.

Sanitary engineering—drainage of buildings and house lots; plumbing and water supply of buildings.

* Mediæval architectural history.

* The history of ornament—lectures and blackboard exercises.

* The decorative arts—embroidery, weaving, jewelry, metal works, inlays: lectures and sketching; excursions.

* For convenience these subjects are given in alternate years, the third- and fourth-year students taking them together. In 1887-88 both classes take the work here set down for the fourth year; in 1886-87, that set down for the third year.

* Specifications and working drawings—carpentry, painting, glazing, plumbing; iron-, lead-, and copper-work; tinning and slating; lectures and laboratory work; excursions.

Architectural design—alterations and restorations; problems.

Geology—historical.

Drawing—water-colors.

SUMMER VACATION.

Memoir.

FOURTH YEAR.

(Without distinction of sessions.)

Civil Engineering—theory of strains and strength of materials continued—graphical methods of determining strains; deflection of beams and girders; quantity of material in braced girders under various conditions of loading and supports; angle of economy for bracing; torsion of shafts; crushing and tensile strength of materials; working strains and working load; mode of estimating cost of girder work.

Graphical statics.

Sanitary engineering—ventilation and warming of buildings. Sewerage.

* Business relations between architects, clients, mechanics, and draughtsmen; office papers; competitions; legal obligations; superintendence.

* Estimates—quantity, weight, time, labor, cost; squaring.

* Modern architectural history.

* The history of painting and sculpture.

* The decorative arts—embroidery, weaving, jewelry, metal works, inlays; lectures and sketching; excursions.

* The theory of architecture—the theory of color, the theory of composition.

Literature and criticism—themes, reports; abstracts of books.

Economic geology—clay, limestones, cements, building and ornamental stones.

Architectural design—problems.

Project.

* For convenience these subjects are given in alternate years, the third- and fourth-year students taking them together.

VII.—COURSE IN SANITARY ENGINEERING.

SECOND YEAR.

FIRST SESSION.

Analytical geometry—text-book: Peck's Analytical Geometry.

Graphics—descriptive geometry. Text-book: Church's Descriptive Geometry.

The elements of architecture.

Botany—lectures, and Gray's Botanical Text-Book.

Zoölogy—lectures, and Nicholson's Manual of Zoölogy.

Applied chemistry—lectures and recitations; Wagner's Chemische Technologie—air, water, artificial illumination, photography.

Quantitative analysis—lectures, and Cairns' Quantitative Analysis.

Elements of biology and the use of the microscope—lectures and laboratory practice.

Drawing—topographical drawing; tinting and grading; problems in graphics.

SECOND SESSION.

Differential and integral calculus—text-book: Peck's Practical Calculus.

Graphics—shades and shadows; perspective, isometrical drawing.

Stereotomy—text-book: Mahan's Stone-Cutting.

The elements of architecture, continued.

Botany—lectures, and Gray's Botanical Text-Book.

Zoölogy—lectures, and Nicholson's Manual of Zoölogy.

Applied chemistry—lectures and recitations; Wagner's Chemische Technologie—limes, mortars, and cements; building stones: decay and preservation; timber and its preservation; pigments, paints, essential oils, varnishes; glass and ceramics; explosives: gun-powder, gun-cotton, nitro-glycerine; electro-metallurgy, etc.

Quantitative analysis—lectures, and Cairns' Quantitative Analysis.

Elements of biology and the use of the microscope—lectures and laboratory practice.

Drawing—construction drawing; mapping; problems in graphics.

SUMMER VACATION.

Surveying—lectures, recitations, and field work; pacing; compass and chain surveys; topographical work; use of solar compass in land surveys; adjustments and use of transit and wye level for triangulation; traversing, city surveying, and levelling; use of plane table; hydrographic surveys.

(Summer class in surveying.)

THIRD YEAR.

FIRST SESSION.

Mechanics of solids, including forces, moments, equilibrium, stability, etc., and elementary machines; dynamics, including uniform, varied, rectilinear, and curvilinear motion, rotation, vibration, impact, work done, etc.

Engineering—general principles relating to materials and structures, physically and mechanically considered.

1. Materials—stone, cements, brick, metals, timber, treated in regard to strength, durability, mode of preparation, defects, test of quality, and fitness for special uses.

2. Structures—earthwork, execution of earthwork, foundations and supports, superstructure, joints; stability, strength, and stiffness of parts; special rules of construction for masonry of public buildings, bridges, retaining walls, arches, railroads, common roads, and canals.

Physical properties of materials—pig-iron: castings, chilled and malleable; wrought iron: bar, shapes, plate, tube and wire; steel: ingot metal, castings, shapes, and plate; other metals and alloys, especially those used in house-drainage and plumbing.

Sanitary engineering—drainage of buildings and house lots; water supply of buildings.

The principles of hygiene—causes of disease, methods of investigation and of prevention, vital statistics, lectures and laboratory practice.

Architectural specifications and working drawings—excavation, foundations, piling, stonework, brickwork, plastering and stucco-work; lectures; excursions.

Quantitative analysis.

Geology—lithological, cosmical, and physiographic.

Biology—laboratory practice.

Drawing—general engineering construction.

SECOND SESSION.

Mechanics of fluids, including pressure, buoyancy, and specific gravities, motion in pipes and channels, undulation, capillarity, tension and elasticity of gases, the atmosphere, the barometer, barometric formulæ, and hypsometry.

Engineering—theory of strains and strength of materials—elasticity, mechanical laws, application of principles of mechanism to beams, girders, and roof trusses under various conditions of loading and supports.

Physical properties of materials, continued from first session.

Sanitary engineering—drainage of buildings and house lots ; water supply of buildings.

The principles of hygiene—causes of disease, methods of investigation and of prevention, vital statistics ; lectures and laboratory practice.

Architectural specifications and working drawings—carpentry, painting, glazing, plumbing ; iron-, lead-, and copper-work ; tinning and slating ; lectures and laboratory practice ; excursions.

Geology—historical, including palæontology, or a systematic review of recent and fossil forms of life.

Biology—laboratory practice.

Drawing—general engineering construction ; machine construction.

SUMMER VACATION*Memoir.*

FOURTH YEAR.

(*Without distinction of sessions.*)

Civil engineering—hydraulic and sanitary engineering, embracing water supply for cities and towns, for the purposes of irrigation and improvement of lands ; quantity and quality of water required ; rainfall, flows of streams, storage of water, capacity of water-sheds, impurities of water ; practical construction of water-works, pumping machinery ; clarification of water ; systems of water supply. Disposal of refuse and waste products ; garbage and offal sewage, etc. ; sewage farming, earth filtration, chemical purification.

Dynamics of machinery—prime movers as driven by animal power, water power, steam power, compressed or heated air, wind power, comprising the theory of animal power, theory of water-wheels, overshot wheels, undershot wheels, breast wheels, turbines, reaction wheels, centrifugal pumps; properties and laws of heat as applied to the generation of steam in steam boilers, and to heating and ventilation; properties of steam and air in their relation to prime movers; mechanical theory of heat, applied to steam-engines, hot-air engines, compressed-air engines; general description of heat engines of various forms; description and theory of ventilating fans or blowers.

Hydraulic engineering—application of principles of mechanics of fluids to determining the discharge of water over weirs or dams; the dimensions of conduit pipes; discharge of canals and rivers; the effects of varying forms and sections of channels and of obstruction to flow; the gauging of streams; retaining walls for reservoirs.

Mechanical engineering—

1. Steam boilers: construction, wear and tear, fittings, setting, testing, care and management, firing, feeding, injectors, pumps, etc.
2. Mechanism of engines, valve gearing, link motions, governors, etc.
3. Management of engines, erecting, emergencies, special types of engines, etc.
4. Proportions of engines, etc.
5. Testing efficiency of engines and boilers.
6. Pumps, hoisting engines, ventilating machinery.
7. Construction and management of hot-air, gas, and petroleum engines, etc.
8. Machine tools.

Kinematics of machinery—

1. General theory of motion.
 2. Uniform and varied motion.
 3. Composition of motions.
 4. Instantaneous centre and centroids.
 5. Transmissions by rolling and sliding contact, by belting, ropes and chain, by shafting and linkages, by fluids.
 6. Engaging gears, reversing and quick-return motions.
- Works of sewerage—rainfall and sewers; influence of geological and topographical features of the sites of towns

and districts ; discharge of sewers ; intercepting sewers ; forms, modes of construction, and materials used ; flushing of sewers and ventilation ; traps, outfalls, tide-valves ; subsoil and surface drainage of towns ; house drainage ; the drainage of malarial districts of country, the surface and subsoil drainage of the sites of cities and towns ; the construction and management of street pavements ; the general principles of heating and ventilation of dwelling-houses, halls of assembly, schools, public buildings, etc., in connection with sanitary and architectural arrangements.

The practical designing of house drainage, and of heating and ventilating apparatus for dwelling-houses, public buildings, hospitals, schools, etc.; and methods of computation and investigation for determining the magnitude of heating furnaces, quantity of heating surface, size of blowers or fans for ventilating purposes, size of ventilating air-ducts or conduits and passages, and the general arrangements of the sanitary apparatus in public and private buildings.

Sanitary jurisprudence—health organizations ; the law of nuisance, specifications and working drawings, etc.

Dangerous trades and occupations.

Organic chemistry—lectures.

Laboratory practice.

Drawing—construction and special.

Project or thesis.

DEPARTMENTS OF INSTRUCTION.

MATHEMATICS.

The students of the first class attend four hours per week throughout the year. In the first session they complete the subject of geometry, volumetric and spherical; the parabola, ellipse, and hyperbola, geometrically treated; and algebra, including the general principles and properties of logarithms and the logarithmic series, the general theory of equations, embracing the principal transformations and properties, derived equations and equal roots, Sturm's theorem and the solution of higher equations. In the second session they are taught trigonometry, plane, analytical, and spherical, with the solution of many practical problems by formulæ and by construction; and the mensuration of surfaces and of volumes.

The students of the second class attend four hours per week throughout the year. In the first session, they complete the subject of analytical geometry, with applications to lines and surfaces of the second order; and in the second, the differential and integral calculus, with some of its applications to mechanics and astronomy, as centre of gravity, moment of inertia, falling bodies, attraction of homogeneous spheres, orbital motion, law of force, etc.

MECHANICS.

This subject is taught during the third year. The course of instruction embraces the following subjects:

Representation and measurement of forces; composition, resolution, and equilibrium of forces; principles of moments and virtual moments; theory of parallel forces; application to centre of gravity; stability.

Elementary machines: friction, resistance to rolling, stiffness of cords, atmospheric resistance.

General equations of motion: rectilineal, uniform, and

uniformly varied motion; curvilinear motion, free and constrained; centrifugal force; application to the governor; vibratory motion; application to the pendulum; motions of translation and rotation; moment of inertia, principal axes, and ellipsoid of inertia; laws of impact; centre of percussion; general theorem of work; accumulation of work; application to fly-wheel.

Mechanics of fluids: pressure due to weight; equal transmission of pressures; application to hydraulic press; buoyancy and flotation; application to specific gravity.

Tension and elasticity of gases and vapors: laws of variation; application to pumps and siphons; investigation of the barometer formula; motion of liquids in pipes and open channels; living force of fluids; application to hydraulic ram; mechanics of capillarity.

PHYSICS.

The students of the first class are occupied during the first term with the subject of heat, including the steam-engine, and with the subject of acoustics; during the second term, in the study of optics, voltaic electricity, magnetism, and electro-magnetism. The courses are fully illustrated by appropriate experiments, and practical problems are occasionally proposed for solution.

To the students of the third class, courses of lectures are delivered on the laws of electrostatics and electrodynamics, electrical constants, dynamo-electrical machines, electric lighting, etc., on the mechanical theory of heat, on mathematical optics, and on the undulatory theory of light. The lectures, except those on the mechanical theory of heat, are fully illustrated by experiments.

The cabinet of physical apparatus will rank with the best on this continent, and extensive additions are made to it each year.

CHEMISTRY.

I. GENERAL CHEMISTRY.—The first class attends two lectures a week in general chemistry; on the metals during the first term, on organic chemistry during the second term. The class is divided into four sections, each of which recites once a week to the assistant instructor. It is intended to lay the foundation of a thorough knowledge of the theory of the subject preliminary to the practical instruction in the chemical laboratory. For this purpose the students are drilled upon the lectures, with free use of a

text-book. They are expected to write out full notes. At the end of the year they must pass a rigid examination before being admitted to a higher grade. In the course of analytical and applied chemistry, attendance is required twice a week, during the second term, in chemical physics.

The second class, in the course of analytical and applied chemistry, attends four recitations per week throughout the year, in Cooke's Chemical Philosophy.

II. ANALYTICAL CHEMISTRY.—There is a laboratory devoted to qualitative analysis, another to quantitative analysis, and an assay laboratory. These laboratories are provided with all the necessary apparatus and fixtures, and each is under the special charge of a competent instructor, with an assistant. Each student is provided with a convenient table, with drawers and cupboards, and is supplied with a complete outfit of apparatus and chemical reagents.

During the first year, qualitative analysis is taught by lectures, blackboard exercises, and recitations, and the student is required to repeat all the experiments at his table in the laboratory. The class is divided into four sections, each of which recites once a week to the assistant instructor. Having acquired a thorough experimental knowledge of the reactions of a group of bases or acids, single members of the group or mixtures are submitted to him for identification. He thus proceeds from simple to complex cases, till he is able to determine the composition of the most difficult mixtures.

When the student shows, on written and experimental examinations, that he is sufficiently familiar with qualitative analysis, he is allowed to enter the quantitative laboratory.

During the second, third, and fourth years, quantitative analysis is taught by lectures and recitations, and the student is required to execute in the laboratory in a satisfactory manner a certain number of analyses. He first analyzes substances of known composition, such as crystallized salts, that the accuracy of his work may be tested by a comparison of his results with the true percentages.

These analyses are repeated till he has acquired sufficient skill to insure accurate results. He is then required to make analyses of more complex substances, such as coals, limestones, ores of copper, iron, zinc, and nickel, pig-iron, slags, air, water, foods, disinfectants, technical products,

etc.,—cases in which the accuracy of the work is determined by duplicating the analyses and by comparing the results of different analyses.

Volumetric methods are employed whenever they are more accurate or more expeditious than the gravimetric methods. In this way each student acquires practical experience in the chemical analyses of the ores and products which he is most likely to meet in practice.

III. ORGANIC CHEMISTRY.—The general principles of this subject are taught by lectures and recitations during the second session of the second year. More detailed instruction is given to the students in the course of analytical and applied chemistry during the fourth year, when they are admitted to the organic laboratory. This instruction continues during the entire year, and consists of lectures, recitations, informal blackboard conferences in the laboratory, and analytical and synthetical work at the laboratory table.

The laboratory work of each student consists of:

(1) Ultimate analyses, including determinations of carbon, hydrogen, nitrogen, sulphur, and haloid elements in organic substances; determination of vapor densities, specific gravities, melting and boiling points, and calculation of formulæ.

(2) Preparation, by synthesis, of a limited number of organic compounds. The student is taught to apply, experimentally, the reactions learned in the lecture-room, the object being to familiarize him with the various methods of synthesis.

(3) Applications of organic chemistry to the arts; especially the use of the artificial coloring matters prepared by the students, such as rosanilin, alizarin, indigo, etc., to dyeing and calico printing, and the testing of commercial colors and mordants.

(4) A complete but concise memoir on each substance prepared, including its history, preparation, constitution, properties, applications, and a list of references to its literature.

IV. ASSAYING.—During the third year, the student is admitted to the assay laboratory, where he is provided with a suitable table and a set of assay apparatus, and where he has access to the sampling and milling machinery, crucible and muffle furnaces, and to volumetric apparatus for the assay of alloys.

The course includes :

1. Lectures and recitations. 2. Practical work.

The lectures treat of and describe the furnaces, fuels, apparatus, reagents, etc., employed, and explain the general principles as well as the special methods of sampling and assaying. Models and lantern views of the furnaces and apparatus are shown, and the ores of the various metals and the appropriate fluxes are exhibited and described. The recitations follow the lectures, and are held by the assistant instructor, the class being divided into small sections for the purpose.

The practical work includes the testing of reagents and small samples of ore, practice on methods, and special work to familiarize the student with sampling large lots of ore, and to give practice in mill and furnace assay.

The student is supplied with the different ores, and is required to assay each, under the immediate supervision of the instructor.

To facilitate the assay of ores of the precious metals, a system of weights has been introduced, by which the weight of the silver or gold globule obtained shows at once, without calculation, the number of troy ounces in a ton of ore.

To furnish necessary facilities for practical work, the following plant has been provided :

1st.—Arrangements for sampling large and small lots of ore. These consist of crushers, rolls, sizing sieves, Hendrie and Bolthoff pulverizer, sampling and grinding plates.

2d.—Appliances for milling and amalgamation, such as small stamp mill, plates, steam-jacketed pan, settler, retorting apparatus for amalgam, etc.

3d.—Concentration appliances, both by hand and machine work, such as pans, jigs, Frue vanner, Golden Gate concentrator, etc.

4th.—Furnaces for roasting and smelting, with small plant for making leaching tests of chloridized ore.

The machinery is run by one fifteen-horse power engine. In order to make the plant as practical as possible, the arrangement, as far as space will permit, is the same as is usual in milling and concentrating ores on a large scale. In following out the course of instruction, lots of 1,000 lbs. of ore in lump are given out to the students, who are required to sample and assay the same, and then, from the assay and mineral characteristics of the ore, determine upon a method of treatment. If the ore is one which should be concentrated, the students to whom the sample is assigned

will size it, concentrate by different methods, assay the concentrates, middlings, tailings, etc., and make up a clear statement as to the method and the results, giving an opinion, founded upon the facts observed, as to how the ore should be treated.

V. APPLIED CHEMISTRY.—The instruction in applied chemistry extends through the second, third, and fourth years, and consists of lectures and recitations illustrated by experiments, diagrams, and specimens. Wagner's *Chemische Technologie* is used as a text-book.

The subjects discussed are :

IN THE SECOND YEAR.

(For all students.)

- I. Air : nature, sources of contamination, sewer gas, plumbing, draining, disinfection, ventilation.
- II. Water : composition of natural waters, pollution, disposal of sewage and house refuse.
- III. Artificial illumination : candles, oils, and lamps, petroleum, gas and its products, electric light.
- IV. Photography.
- V. Limes, mortars, and cements.
- VI. Building stones : decay and preservation.
- VII. Timber and its preservation : pigments, paints, essential oils, varnishes, preserving processes.
- VIII. Glass and ceramics.
- IX. Explosives : gunpowder, gun-cotton, nitro-glycerine, etc.
- X. Electro-metallurgy.

IN THE THIRD AND FOURTH YEARS.

(For students in the course of analytical and applied chemistry and of metallurgy.)

- I. Chemical manufactures : acids, alkalies, and salts.
 - (1) Sulphur, sulphurous acid, hyposulphites, sulphuric acid, bisulphide of carbon, etc.
 - (2) Common salt, soda ash, hydrochloric acid, chlorine, binoxide of manganese, bleaching powder, chlorates, chlorimetry, etc.
 - (3) Carbonate of potash, caustic potash.
 - (4) Nitric acid and nitrates.
 - (5) Iodine, bromine, etc.
 - (6) Sodium, aluminium, magnesium.
 - (7) Phosphorus, matches, etc.

- (8) Ammonia salts.
- (9) Cyanides.
- (10) Alum, copperas, blue vitriol, salts of magnesia, baryta, strontia, etc.
- (11) Borates, stannates, tungstates, chromates, etc.
- (12) Salts of mercury and silver.
- (13) Oils, fats, soaps, glycerine.
- II. Food and drink: milk, cereals, starch, bread, meat, tea, coffee, sugar, fermentation, wine, beer, spirits, vinegar, preservation of food, etc.
- III. Clothing: textile fabrics, bleaching, dyeing, calico printing, paper, tanning, glue, india-rubber, gutta-percha, etc.
- IV. Fertilizers: guano, superphosphates, poudrettes, etc.

GEOLOGY AND PALÆONTOLOGY.

The course of instruction in this department is as follows:

SECOND YEAR.

Botany and zoölogy, as an introduction to palæontology—lectures throughout the year.

THIRD YEAR.

Lithology: minerals which form rocks and rock masses of the different classes—lectures and practical exercises.

Geology: cosmical, physiographic, and historical—lectures and conferences throughout the year.

FOURTH YEAR.

Economic geology: theory of mineral veins; ores; deposits and distribution of iron, copper, lead, gold, silver, mercury, and other metals; graphite, coal, lignite, peat, asphalt, petroleum, salt, clay, limestone, cements, building and ornamental stones, etc.—lectures and conferences throughout the year.

MINERALOGY AND METALLURGY.

I. MINERALOGY.—The studies in mineralogy continue throughout two years. During the first year the students are instructed in the use of the blowpipe, in crystallography, and in theoretical mineralogy.

The instruction in blowpipe is entirely practical, and lasts through the first half of the year. It consists in instruction how to use the different flames, and in teaching

the students how to examine mixtures, alloys, and natural compounds, so that they are able to determine with ease the constituents of a mixture containing a large number of simple substances. In order to do this, substances whose composition they know are given to them, upon which they are required to perform all the characteristic reactions which take place in the different flames with different fluxes. After they are sufficiently familiar with the behavior of substances, the composition of which they know, they are given substances, the composition of which they do not know, to determine.

The collection of blowpipe substances consists of four hundred alloys, mixtures, and minerals. Students are taught to examine, qualitatively, all the different commercial alloys, and a large number of the natural combinations which exist in minerals. The blowpipe laboratory is a large, well-ventilated room to which the students have access at all hours of the day, where each student has a drawer, with a lock, assigned to him, which he retains until the close of the term.

At the commencement of the second term the lectures on crystallography commence. They embrace the entire subject of crystallography, including the descriptions of both normal and distorted forms, for the study of which the students have access to a collection of over 300 models in wood, embracing all the theoretical forms. Besides this collection, they have the use of the collection of 150 models in glass, and have access to the collection of minerals, most of the species of which are illustrated by models in wood, showing the perfect and distorted crystallographic forms.

Conferences are held during the term, in which the students are required to determine models of the theoretical forms as well as those found in minerals. They are also taught theoretical mineralogy, including the optical and physical properties of minerals, which lectures are illustrated by a very complete set of apparatus, presented by F. A. Schermerhorn, and a cabinet containing a large number of sections of minerals for lantern and instrumental use. For the study of sections the students are taught the use of Groth's polariscope, and of goniometers.

At the commencement of the third year the students begin the study of practical mineralogy. They are required to determine minerals by the eye, or by asking questions with regard to those characteristics which cannot be determined without experiment. They are required to give the name, the composition, the crystalline form, and the promi-

nent blowpipe, chemical, and physical characteristics of the mineral they determine. To facilitate this work they have unrestricted access to a collection of about 3,000 carefully labelled specimens, on which they are allowed to make any experiments. They have besides constant access to the cabinet of minerals, which contains about 30,000 specimens, arranged in table cases, to show the different characteristics of minerals, and about 3,000 specimens arranged in wall cases, to show their association. The crystals of minerals are arranged upon pedestals in such a way that they can be readily seen and examined by the students.

At the commencement of the second term of the third year they are required to determine such minerals as they are likely to find in the field, by testing them with the blowpipe and such magnets and instruments as they are likely to have in the outfit of an ordinary survey.

Most of the instruments in this department were presented to the school by D. Willis James, C. R. Agnew, and the late Gouverneur Kemble. The collection of minerals was founded by a valuable collection presented as the first donation to the school, before it was opened in 1864, by the late George T. Strong of this city. It was shortly afterward supplemented by another collection presented by the late Gouverneur Kemble, containing many autographs and specimens from the cabinet of Haüy. As these collections were both very rich in duplicates, very many valuable additions have been made to the cabinet by exchange. Collections were also made in Europe during several years by the professor in charge, having the necessities of the collection of the school in view, and were presented to the school through the generosity of Morris K. Jesup, Wm. E. Dodge, Jr., D. S. Egleston, C. Lanier, and J. Crearer, of this city; and the late John H. Caswell, Wm. H. Aspinwall, and R. P. Parrot.

II. METALLURGY.—The lectures in metallurgy continue through two years, and discuss in detail the methods in use in the best establishments in this country and in Europe for working ores. They embrace, in general metallurgy, the subjects of combustion, fire-clays, furnaces, natural fuels,—wood, peat, lignite, bituminous, and anthracite coals,—artificial fuels, charcoal, peat charcoal, and combustible gases manufactured in generators, chimneys, the different kinds of blast engines, regulators, hot-blast ovens, and tuyeres.

The metallurgy of iron consists in discussion of the general properties of iron and its ores; theory of the blast-furnace process—the causes of variation in the charge pro-

duced in the furnace by the blast, by the fuels, by the variations in the charge, and by the form of the furnace; the effects of moisture; the methods of ascertaining the cost; the calculations of the heat developed and lost in the furnace; moulding; melting the iron in crucibles, in cupolas, in reverberatory furnaces; methods of making the moulds; precautions required in casting; and the manufacture of malleable cast-iron. In the manufacture of wrought from cast-iron, the German process and its modifications are discussed; the English processes, including fining; the dry and boiling process in puddling; stationary and rotary furnaces; shears, hammers, squeezers, saws, rolls; reheating in ordinary and regenerator furnaces; two and three high trains; method of calculating cost of wrought-iron. In the manufacture of iron from the ore the Catalan processes and its derivatives are discussed in the metallurgy of steel, low-furnace processes, puddled steel, cement steel, basic and acid Bessemer steel, basic and acid Siemens-Martin steel, crucible steel, the utilization of scrap iron, manufacture of sheet-iron, nails, wire, and rails.

The lectures on the metals include the treatment of native copper; the treatment of pure sulphurous ores by the Swedish, German, and mixed methods in Europe and the United States; the treatment of rich pure ores; the treatment of impure ores in the Hartz mountains and in the United States; the treatment of very poor ores by lixiviation; the treatment of rich and poor ores by the English methods in the reverberatory furnace in the United States and Europe, and the treatment of impure ores in the same furnace; treatment of oxidized ores in the United States and Europe; method of making calculations for works treating a definite number of tons; mixed method; treatment in Europe and in the United States; treatment of oxides of copper, wet methods; treatment of ores of lead, roasting and reaction, in France, England, and the United States; method of roasting and reduction; method by precipitation in France, Germany, and the West; mixed method in France, Germany, and the West; refining of lead; extraction of silver by the Pattison method and by zinc; cupellation; condensation of volatile products; treatment of silver ores in furnaces in Germany and in the United States; separating of silver by amalgamation, Saxon method, Mexican method, pan amalgamation, treatment in the wet way; Augustin's methods, Ziervogel's methods, Von Patera's method, Russel's method; refining

silver; treatment of gold ores, washing, sluicing, hydraulic mining, Plattner's process, parting gold and silver; treatment of tin, in shaft furnaces and in reverberatory furnaces; treatment of ores of zinc, Silesian method, Belgian method, English method, wet method; treatment of ores of mercury, method by precipitation, by roasting, in Europe and in California, by the wet way; treatment of ores of antimony; treatment of nickel and cobalt; treatment of ores of bismuth.

It is designed to make these lectures as practical as possible, and for this purpose the economic details of cost are given whenever they can be obtained from authentic sources. Special details are given of the ores of this country which are difficult to treat, to the solution of practical problems which may occur, and to changes which different economic relations are liable to cause in the treatment of the same ore in different localities.

Nearly a thousand lecture diagrams and the same number of photographic illustrations for use in the lantern have been prepared to illustrate the furnaces, machines, and appliances used in the different metallurgical works, as well as to illustrate the construction of furnaces, etc.

The collection illustrating the department of metallurgy includes models of furnaces and a very large collection of drawings and tracings, in most cases copies from the working drawings of establishments in actual operation. This collection embraces several hundred tracings collected from the best types of works in this country and abroad, many of them being sufficiently detailed to be used as construction drawings.

The metallurgical collection, properly speaking, embraces about 3,000 specimens, illustrating every stage of all the prominent metallurgical processes. Many of these specimens have been analyzed and assayed. They are constantly open to the inspection of the students.

As an application of the lectures, the students are required to work out a project, and to present working drawings and estimates for the erection of works to treat a given ore under stated conditions. The problems given are those which require solution in some parts of the United States.

ENGINEERING.

Engineering, in its widest sense, involves applications of the sciences of physics, mechanics, and chemistry to a

great variety of problems met with in works and enterprises of a public and private nature or of an industrial character, in which the employment of materials, the building of structures, the use of machinery, the utilization of natural resources, or the protection or improvement of the ways of commerce, are essential and important elements and conditions. The educated engineer, whatever may be the branch of the profession to which he devotes himself, should, therefore, have a thorough foundation of knowledge in certain subjects of common application,—for example, free-hand and instrumental drawing, mathematics, physics, and mechanics, and the application of these sciences to the resistance of materials, to machinery, to structures of iron and wood and masonry; the flow of streams in artificial channels required for water-works, drainage, and for sanitary purposes; the theory of heat as applicable to air and steam in their various uses, in ventilation, etc.

The courses in mining engineering and civil engineering are, therefore, identical in all that pertains to these subjects.

It is essential, however, that in each of these branches of engineering, the subjects technically appertaining to each should receive as great a share of the attention of the students, in the courses in mining and civil engineering respectively, as possible in the short period devoted to collegiate instruction.

The mining engineer encounters in his practice questions which are rarely met with in civil engineering—for example, the results of experience in the searching for, winning, and exploitation of mineral deposits, special problems in ventilation, and drainage; while, on the other hand, he is seldom or never called upon to discuss questions which are common and important in the practice of civil engineering, such as the supply of water to towns and cities, and other sanitary works on a large scale, the erection of extensive public buildings, the improvement of harbors and rivers, works of irrigation, the building of extended bridges, etc.

The arrangement of the two courses in engineering has been made under the above views of the subject, utilizing, as it does, in the best manner, the time of the instructors, and avoiding a repetition of the same instruction to different classes.

The collateral branches of study for the engineering courses, chemistry, metallurgy, geology, subjects quite as essential to mining and civil engineers as physics and

mechanics, have also been assigned to these two courses, in accordance with the general requirements of the respective professions.

I. DRAWING, DESCRIPTIVE GEOMETRY, ETC.—The course in drawing embraces instrumental drawing, descriptive geometry, shades, shadows, and perspective, stone-cutting, isometric drawing, topographical and geological drawing, drawings of engineering constructions and machinery.

The first year is devoted to the elements of instrumental drawing, the use of instruments, lettering, projections of objects, plans, sections and elevations, intersection of solids and of surfaces, and the development of surfaces.

During the vacation which follows, the execution of sketches from nature and from engineering and architectural constructions is required.

During the second year, the first session is occupied in the study of descriptive geometry, in grading and tinting as well as in topographical drawing.

The instruction in these subjects requires all problems and illustrations to be carefully and neatly executed on the drawing-board, and the principles of construction explained by the student in oral examinations.

During the second session, the subjects of shades and shadows, perspective and isometrical drawing, and stone-cutting, are taken up in the same manner. Practice is also given in drawing the simple elements of architecture, such as the plans of private and public buildings, showing the details of walls, floors, windows, and door casings, etc.

The drawing of the third year includes work from models and from blue prints, etc., furnished by various machine-shops and engineering firms. General engineering-construction drawing is taught first; then a systematic method of machine-construction drawing, accompanied by lectures. Maps are also drawn from field work executed by the students themselves.

During the vacation which follows, the necessary drawings for memoirs are made.

The drawing and engineering designing of the fourth year are intimately connected. A variety of strain sheets of graphic statics are first drawn, and the remainder of the time is devoted to the designing of engineering structures, including the making of bills of materials and complete working drawings.

The whole course of drawing is progressive, and embraces nearly 100 sheets, each succeeding sheet being illustrative

of a principle of construction or an advance toward more difficult methods or combinations; and it is designed to qualify students for the execution of all kinds of drawing and the most difficult constructions.

II. SURVEYING.—The instruction in surveying is given in a special summer class during the vacation between the second and third years. Six weeks are devoted to practical work in the field, supplemented by lectures and instruction in the theory of surveying, and office-work for the computation of surveys and construction of maps.

The students are divided into squads of two men, each squad being provided with instruments, and required to execute a certain number of surveys. Each survey is preceded by class exercises, intended to familiarize the students with the details of the work, and each survey forms the subject of a report, with computations, maps, etc.

At first these surveys and exercises are without instruments, the students being drilled in methods of ascertaining distances and making rough surveys by pacing, and by employing the height of the body, the length of the arm, etc., for making measurements when instruments are not available.

These exercises are followed by others with chain, sight-poles, hand-level, and other equally simple forms of apparatus, and by a topographical survey, showing the application of such rough and rapid methods of work for reconnaissance surveys demanding approximate accuracy only. Next the students make surveys with the ordinary surveyor's compass and chain, and with the solar compass, and magnetic surveys with the attraction compass and dipping needle.

Finally, they are practised in the adjustments and use of the more accurate instruments, including field-work in triangulation, traversing, and levelling, and surveys with the plane table.

The following exercises and surveys are required of each squad of students:

1. Exercises for determining length of pace, and practice in pacing.
2. Survey of a field by pacing.
3. Exercises in sketching contour lines and topographical details—two examples.
4. Exercises in chaining over level and sloping ground, and in construction of right angles and parallel lines with chain.

5. Exercises in ranging straight lines with sight poles under different conditions.

6. Exercise in reading compass bearings.

7. Survey, with compass and chain, of a farm of about twenty acres, including location of fences, roads, and farm buildings, correction of bearings for local attraction, computation of latitudes, departures and area, and a plat.

8. Adjustment of hand level and exercise in levelling.

9. Topographical survey on rectangular plan, with compass, chain, and hand level, determining minor details by pacing, with finished map of area surveyed.

10. Adjustments of the transit.

11. Triangulation. As an exercise for practice in the use of the transit each squad is required to make three or four sets of readings of each angle of a triangle, each set including six repetitions.

12. Determination of true meridian, by observation on polaris.

13. Traverse of a polygon of about twelve sides, the angles being repeated and the sides measured with a steel tape, with allowances for catenary, temperature, and inclination. Computation of ordinates and abscissas, and a plat.

14. Adjustment of telemeter wires and measurement of distances by telemeter.

15. Azimuth traverse of a polygon, distances by telemeter readings.

16. City survey. Exercise in laying out city lots and in determining exact position of house and fence lines—report and plat.

17. Adjustments of the wye level.

18. Line of levels, about one mile in length, determining levels of stations 100 feet apart, and of benches.

19. Plane-table survey. Each squad of two men is required to make a survey of about 70 acres, determining all topographical details and locating contours 20 feet apart.

20. U. S. mineral survey, with the solar compass, of a mining claim 150 feet by 1500, complying with the requirements of the Land Office and the instructions of the Surveyor General.

21. Hydrographic survey. For this survey the squads are increased to six men, and each squad is required to survey about 30 acres, making about 250 soundings, each sounding being located by two transits.

The mining-claim survey is required of students in the courses of mining engineering and metallurgy, and the

hydrographic survey of students in the course of civil engineering.

22. A magnetic survey with attraction compass and dipping needle, and a stratigraphic survey, with construction of geological sections and lines of outcrops, may replace, for students in mining engineering, one or more of the exercises above noted.

In the vacation between the third and fourth years, the students of mining engineering, during the session of the summer school of practical mining, make underground surveys and construct maps and sections of the mines visited.

During the fourth year a line of railroad is surveyed, locating the line on the ground, setting grade and slope stakes, levelling, and calculation of cuttings and embankments, drawings and estimates. In addition, the course in railroad engineering for the civil engineers embraces practical lectures on railroad construction, permanent way, rolling stock, motive power, and administration of railroads, with instruction in the economics of location and transportation.

III. CIVIL ENGINEERING.—Instruction in civil engineering extends through the third and fourth years.

During the third year, the more simple elements of civil engineering and surveying are taught. In civil engineering the various subjects are considered in the following order: first, materials—building stones, limes, cements, mortar, concrete, brick, wood, metals; their properties and general qualities, mode of preparation, and their respective uses, and combinations in construction, their strength and durability: second, masonry—construction of masonry, retaining wall, arches, etc.: third, framing—structures of wood, carpentry: fourth, stone and wooden bridges—descriptions of various kinds of wood and iron trusses in use, suspension bridges, etc., general principles of roof construction: fifth, common-road construction—general principles of railway construction; construction of canals, general principles of rivers, slack-water navigation, etc.

The course of civil engineering in the fourth year embraces the principles of mechanics applied to engineering constructions and to machinery, the strength of materials, the theory of retaining walls and arches, and the methods of determining the dimensions of the parts of iron roof and bridge trusses, by means of the stresses to which they are subjected, the theory of such structures and the details of practical construction; the principles of hydraulics applied

to the improvements of rivers, the water supply of towns, reservoirs, dams, etc.; and the general principles of sanitary engineering, drainage, sewers, house drainage, and ventilation.

A course of lectures, fifty or sixty in number, is delivered during the third year to students in civil and mining engineering on the properties of the metals used in engineering constructions. These lectures are devoted principally to iron and steel, but include also other metals and alloys. They treat of the mechanical processes by which these metals are transformed into the shapes required by the engineer, from the crude state in which they are found, after reduction by metallurgical processes from their ores. The physical properties of such fabricated materials, under the various uses and conditions to which they are subjected in engineering construction, are also treated. The lectures are intended to cover, as far as possible, a field of knowledge which of late years has grown into great importance and prominence as an essential branch of an engineer's acquirements, and which connects the science of metallurgy with the art and practice of engineering. This field embraces not only the arts of fabrication of merchant forms, but also the physical and mechanical properties of the metals in such forms: such as coefficients of strength, limits of elasticity, ductility, adaptability for particular uses and different conditions, etc., which vary greatly with the processes through which the metals have passed, and yet from their nature required to be treated in connection with engineering problems. Instruction is also given in inspection and testing of these materials delivered under contract, embracing the usual practical physical tests, and the relations so far as known between chemical analysis and physical characteristics.

In view of the paramount importance of iron and steel to the engineer of to-day, considerable time is devoted to these metals. The inspection and grading of pig-iron, and the suitability of different grades for various kinds of castings; cupola furnaces and cupola mixtures and their effects upon product; special dangers inherent in castings of certain shapes; principles in design of castings; shrinkage strains and lines of weakness in castings; defects due to cores and to moulds; resistance of cast-iron to corrosion and protection from it; inspection of castings—these are included in a first series.

Chilled castings—their characteristics, uses, production,

and dangers—and malleable castings are similarly treated, including their action under heat and under tools, and the brazing of castings.

Under the head of wrought iron are discussed: piling, heating, and rolling of muck bar; effects of heating and rolling on merchant bar; forge uses and tests of bar; requirements of metal for plate, for tube, for wire, and for special forged shapes, such as bolts, etc.; heating, piling, and rolling for shapes or structural iron; points of defect, characteristics of different shapes, adaptability for different uses; possible sections and areas; combination of sections; protection from corrosion; inspection of structural iron; fabrication of ship and boiler plate; methods and processes, properties, defects, requirements, and inspection; fabrication of tube and pipe, lap and butt welded; continuous and universal mills, bending, welding, and straightening rolls, swaging, testing, and tool work; fittings, forms, and uses.

Under the head of steel are treated: properties of crucible steel resulting from its manufacture, such as uniformity of temper, adaptability for tools and cutters; Bessemer and Siemens-Martin steels; properties of ingot metals, mill and furnace treatment for shapes, springs, tires, bars, and plate; characteristics of ingot plate, effects of alloying impurities; steel castings: their production, characteristics, and defects; iron and steel forging; drop forging, die forging, machine forgings, large and small, heating and handling, excellences and sources of defects; burnt iron and steel.

Incidentally to these topics is discussed the machinery for handling the materials in process of manufacture, so far as they are essential to the primary object in view.

After iron and steel follow lectures upon a similar plan, discussing brass—cast, rolled, and drawn, copper sheet and tubes, lead pipe and sheets, zinc and tin—sheet and tube, and galvanized and tin plate, certain alloys for special needs against friction, corrosion, etc., and the brazing and soldering processes for the various metals receive attention at the close.

The students in the civil-engineering course are also instructed in the principles of mechanism, beginning with the general theory of motion; the principles of transmission of motion, the various modes of mechanical connection, the calculation of relative velocities of moving pieces of machinery, valve gearing, and the mechanism, movements, and construction of machinery in practice; the dynamics of machinery or the determination of the relations between

the forces which act upon machines and the general application of mechanics to machines; the study of prime movers, including steam-engines, hot-air engines, and water-wheels; the theory and construction of steam boilers, and the general principles of heat, as applied to air and vapors.

IV. MINING ENGINEERING.—The course in mining engineering is the same as that in civil engineering, in drawing and surveying, except that the students of mining have additional instruction in underground surveying and geological reconnoissance. The courses in mining and civil engineering are also identical during the third year in all that relates to materials and general principles of engineering constructions, excepting that the course in mining engineering is intended to be more extended in the principles of mechanism and construction of machinery, and less extended in the detailed principles of roof and bridge construction, hydraulics as applied to river improvements, sanitary engineering, water supply of towns, etc.

During the third and fourth years, the course in mining engineering embraces lectures on practical mining, or miner's work, including excavation of clays, peat, bog-iron ore, and other easily worked materials; quarrying for extraction of large blocks of stone, marble, etc.; blasting, drilling tools, hand-boring, use of explosives; well-boring, by hand for exploration, and machine-boring; sinking of shafts and slopes, timbering and driving of adits and levels; in the use of picks and gads in the mining of coal, salt, fire-clay, and other soft rocks, coal-cutting machines, mining of ores and hard rocks, handling of excavated mineral in working places, underground transportation, tramming by man or animal power; mechanical haulage with chains or wire rope, and by underground locomotives; accidents to men, their cause and prevention; organization and administration; mine book-keeping, accounts with men, time-books, pay-roll, analysis and dissection of mine accounts and making out of cost sheets.

Attendance upon the summer class of practical mining is obligatory for students of mining engineering. The class visits mines and engages in underground work and the study of mine plant and method, under the immediate direction of competent instructors.

The instruction in mining engineering during the fourth year is the same as for the civil engineers in all that relates to the general dynamics of machinery, and to the application of the principles of mechanics to engineering construc-

tions and to the physical properties of materials. It is more extended in the application of machinery to mining purposes, especially in connection with the use of compressed air, pumping and ventilating machinery, and hoisting machinery.

It embraces also the study of mineral deposits ; classification and description of veins, beds, and masses, and their geological characteristics, interruptions, and intersections ; methods of prospecting, of reaching deposits, of prosecuting the underground workings, and methods of making and supporting excavations made for special purposes, junctions of levels, chambers for machines, and of making and supporting excavations in watery strata ; proper provisions for pumping and ventilation ; general principles to be observed in laying out, opening, and working mines, and methods applicable to special deposits, such as narrow and wide veins or lodes, thick and thin seams of coal ; hydraulic mining, etc. ; also instruction in the proper administration of mining works, exterior transportation, mine regulations, etc.

A course of lectures on ore dressing includes the general principles of ore dressing, preliminary hand dressing, and sorting and preliminary cleansing and sizing ; crushing by hand and with machinery ; cleansing in ditches and troughs, in sieves, trommels, and by special machines ; sizing, bar gratings, and other stationary screens, riddles, revolving screens ; concentration of coarse and fine material by jigs, buddles, tables, etc. ; illustrations from American and foreign practice ; mechanical preparation of coal and other minerals, and the concentration and purification of copper, lead, iron, and other ores.

SANITARY ENGINEERING.

The course in sanitary engineering includes that of civil engineering, with special additions from the course on architecture, and special instruction in drainage, water supply, sewerage, heating, and ventilation, dangerous trades and occupations, vital statistics, sanitary jurisprudence, and the principles and practice of municipal hygiene.

BIOLOGY AND HYGIENE.—The object of this course is to give such instruction as to the laws of life and health, the structure of the human body, the general principles of hygiene, first help in accidents and injuries, etc., as should be possessed by every well-educated professional man. It also includes practical instruction in the use of the microscope.

Laboratory instruction for four hours each week is given throughout the second and third years and lectures in each session of the third year.

The biological laboratories are supplied with all apparatus required for microscopical manipulation and for those branches of biological study needed in sanitary investigation. A separate culture-room has been fitted up for bacterial examinations.

The general course of study is indicated in the following scheme:

Microscopy.—Stand, its construction, use, care, and choice; simple lens, optical principle, construction, and use; compound lens, low-power objectives, use, and care; accessory apparatus, general; method of work, illumination, effect of different media; the eyes, peculiarities, use, and protection; drawing, free-hand and with camera lucida; micrometry, preparation of table; magnification, preparation of table; mounting, dry, in liquid and in cells; section cutting, soft and hard tissues, crystals, rock sections, and grains; staining; high-power objectives, use and care, cover-connections, and immersion-fluids; accessory apparatus, special; micro-chemistry and microspectroscopy; micromineralogy and microlithology; adulteration of foods, etc., detection; fibres and handwriting; photomicrography.

Biology.—Laboratory examination of unicellular forms of life: yeast; protococcus; amœbæ; bacteria; the moulds (*mucor* and *penicillium*); the anatomy of the clam; anatomy of the lobster; anatomy of the frog; biological analysis of natural waters; biological analysis of air; biological examination of disinfectants.

Books of reference.—The Microscope, W. B. Carpenter; How to Work with the Microscope, L. Beale; Elementary Biology, Huxley and Martin; Micro-organisms and Disease, Klein; Bacteriology, Crookshank and Hueppe; Photomicrography, Sternberg.

GEODESY AND PRACTICAL ASTRONOMY.

Instruction in geodesy and practical astronomy during the third year embraces:

1. A course of general lectures on astronomy, fully illustrated by lantern views.

2. Lectures on geodesy—general outlines of geodesy; description and illustration of the different kinds of triangulation, primary, secondary, and tertiary; description of the United States Coast Survey primary base apparatus;

description of the United States Coast Survey secondary base apparatus; measurement of subsidiary base lines; reconnoissance surveys; stations and signals; observing tripods and scaffolds; station marks, underground and surface; observation of angles; instruments, direction and repeating; application of Legendre's theorem to the solution of spheroidal triangles; records and computations; latitude, longitude, azimuth, and time observations and computations.

3. Practical use, in the observatory, of the transit instrument for time and zenith telescope for latitude, and in the field, use of the sextant, and reflecting circle for time, latitude, and longitude approximations.

During six weeks of the summer vacation, at the close of the third year, the students in civil engineering are required to make a geodetic survey of some region.

Instruction in geodesy is continued in the fourth year by lectures and use of instruments; spirit levelling; trigonometric levelling; magnetic determinations; figure of the earth; theory of astronomical instruments.

ARCHITECTURE.

During the last half of the first year, and the whole of the second year, the time which is given in other courses to laboratory work is in this course given to architectural drawing. This is so laid out as to include exercises in the ordinary processes of draughtmanship, the making of plans, elevations, sections, and details, both on a large and on a small scale; using pencils and pens, brushes and colors, with auxiliary exercises in tracing and sketching. The examples are so chosen as to make the student familiar with the commonplaces of architectural form, and are accompanied by lectures upon the elements of architecture, in which the forms and proportions of the Greek and Roman orders, of doors and windows, arches, staircases and balustrades, domes and vaults, roofs and spires, are set forth, and the best ways of drawing them explained. These lectures and exercises are supplemented by special courses on perspective, and on shades and shadows. At the same time a series of illustrated lectures is given upon Egyptian, Assyrian, Greek, and Roman architectural history.

During this year the students of architecture complete their elementary studies in mathematics and chemistry, following at the same time the work in descriptive geometry,

stone-cutting, given in the department of engineering, and a portion of the work in geology.

Besides the lectures upon hygiene and kindred topics which are given to the entire third class, a special course upon sanitary engineering is given to the students of architecture. This course covers, in the third year, the drainage of buildings, including the arrangement of pipes and fixtures, the disposal of household refuse, and the drainage of cellars and grounds. During the fourth year, the ventilation and warming of buildings is taken up, and discussed from both the practical and the scientific points of view.

In the third and fourth years the study of scientific construction is pursued in connection with the classes of engineering, most of the time, however, being given to strictly professional work. This is for the most part pursued by the two classes in common, one class taking up in their fourth year what the next class takes in the third, and *vice versa*, the whole thus forming a single two years' course. These studies are arranged under four heads:

I. Under the head of history, the architecture of the middle ages is taken up in one year, and that of the renaissance, and its more modern derivatives in the next. On completing the study of ancient architecture, then, in the second year, one class goes on directly to that of the middle ages in the third year, and to that of the renaissance in the fourth. The next class passes at once from ancient classical architecture to modern, finishing with the mediæval styles.

II. Under the general head of ornament, etc., is comprised the study of the decorative details of the different architectural styles, and of the contemporary forms in other branches of art, especially the decorative arts employed in building. The materials and processes employed in these arts, and the theory of æsthetics, in form and color, come under this head.

III. Under the head of architectural practice comes the study of specifications and working drawings, so far as they can profitably be studied in such a school, and of the materials and processes employed in building operations. The buildings erecting in the neighborhood here serve as examples, and it is proposed that a special architectural laboratory shall afford opportunity for the study of oils and paints, cements, mortars, etc., and of testing their quality.

IV. Under the head of drawing and design is comprised the practice of original composition in the working out of problems in design, from given data, as well as further ex-

ercises in draughtmanship, both free-hand and with the pencil, pen, or brush, illustrating the study of the special topics enumerated above. The laboratory will be provided with facilities for modelling in clay or wax, and for working in plaster.

The students of the fourth year give a certain proportion of time to exercises of a critical and literary character, designed to practise them in both reading and writing.

The buildings recently erected afford ample accommodation for this work, and for the necessary collections of drawings, photographs, casts, and books.

MEMOIRS, PROJECTS, AND DISSERTATIONS.

The following memoirs, projects, and dissertations required from students of the several classes of the year 1886-7, are given simply to illustrate the kind of work required by the by-laws.

Students of the second class in all the courses, except those in geology and architecture, were required to hand to the instructor in drawing, on or before October 11, 1886, six drawings, as follows:

1. Landscape. Free-hand pencil sketch.
2. Iron bridge. Free-hand pencil sketch.
3. Staircase. Free-hand pencil sketch.
4. Steam-pump. Free-hand pencil sketch.
5. Freight wagon. Right line orthographic scale drawings in ink, showing front and end views.
6. Windlass. Right line orthographic scale drawings in ink, showing front and end views.

COURSE IN MINING ENGINEERING.

Students of the fourth class were required to hand to the professor of engineering, on or before October 11, 1886:

A MEMOIR upon some topic assigned to each member of the class in connection with the summer school in practical mining.

Students of this class were also required to choose, for a graduating thesis or project, a subject in geology, in metallurgy, or in engineering, and to hand the thesis or project to the professor of geology, the professor of metallurgy, or the professor of engineering, on or before May 2, 1887.

COURSE IN CIVIL ENGINEERING.

Students of the fourth class were required to hand to the professor of geodesy, on or before October 11, 1886,

memoirs upon topics, assigned to the students individually, on subjects taught in the summer school of practical geodesy.

The students of this class were also required to hand to the professor of engineering, on or before May 2, 1887, a project or thesis on one of the following subjects, viz. :

1. A project for the supply of water to a town, including reservoirs, conduits, and all appliances for distribution.
2. A roof of not less than 180 feet span.
3. A bridge of not less than 300 feet span.
4. Design for the sewerage and surface and subsoil drainage of a town of not less than 15,000 inhabitants.
5. The heating, ventilation, and drainage of a large public building.

The choice of one of these subjects was made during the summer, and such knowledge of the subject chosen as was practicable gained during the vacation by examination of existing works.

The details of the projects or theses were then given to the students at the beginning of the first session after the summer vacation.

COURSE OF METALLURGY.

Students of the fourth class were required to hand to the professor of engineering, on or before October 11, 1886, memoirs on subjects studied in the summer school of practical mining.

Students of this class were also required to hand to the professor of metallurgy, on or before November 1, 1886—

A MEMOIR on one of the following subjects :

1. Regenerative furnaces.
2. Blair's direct process.
3. The Siemens-Martin process.

And on or before May 2, 1887, one of the three following projects :

METALLURGICAL PROJECT.—An establishment to produce 300 tons of pig-iron per day. The furnace will be located east of the Mississippi River. The ore will be composed of hematites and limonites, the hematites yielding 60 per cent. of sesquioxide of iron, 0.055 per cent. of sulphur, and 0.065 per cent. of phosphorus. The limonite will contain 50 per cent. of sesquioxide of iron, and be equally pure. The fuel and fluxes will be such as can be had most readily in the district selected. The air will be heated by a regenerative system of ovens. The furnace will have a closed front, and the charges be made mechanically.

Or, an establishment to make 350 to 400 tons of open hearth steel per week from material purchased. The establishment will be located within ten miles of New York City, with a water front and docks for water transportation, and a railway for inland transportation. All the material used, as well as the fuel, will be purchased in the open market. None of the metal produced will be sold in ingots; it will all be manufactured for the market, the rolling mills for the manufacture being included in the plant.

Or, an establishment to produce and desilverize 10,000 tons of lead bullion, containing on an average 150 ounces of silver and 2 ounces of gold to the ton. The establishment will be located in or west of the Rocky Mountains. The ore will be composed of earthy carbonates, with some galenite, anglesite, and cerussite, and will contain 25 per cent. of lead, 25 per cent. of silica, 25 per cent. of sesquioxide of iron, and 1 per cent. of sulphur. The fuel and fluxes will be such as can be most rapidly had in the district selected.

The projects will comprise memoirs, estimates, and drawings.

COURSE IN GEOLOGY AND PALÆONTOLOGY.

Students of the second class were required to hand to the instructor in drawing, on or before November 1, 1886, six free-hand sketches as follows:

1. Steam-engine.
2. Stone or wooden bridge.
3. Derrick.
4. Steam-pump.
5. Water-wheel.
6. Landscape.

These drawings and sketches must be drawn from the objects themselves, on sheets 15 x 22 inches, and location, date, and signature must be given on each.

Students of the third class were required to hand to the professor of geology, on or before November 1, 1886:—

A MEMOIR on one of the following subjects:

1. Notes on the flora or fauna of any geographical district visited.
2. Observations on the structure, distribution, and habits of any of our fresh-water fishes.
3. Catalogues and collections of mollusks inhabiting any lakes, rivers, or districts.
4. Notes on the economy of observed insects.

5. Notes on the various observed methods by which the seeds of plants are distributed.

Students of the fourth class were required to hand to the professor of geology, on or before November 1, 1886:

A MEMOIR on one of the following subjects:

1. Report on the geology of any district visited—embracing: *a.* topographical features and their causes; *b.* surface geology; *c.* sections of strata with lithological character, thickness, dip, strike, and fossils of each bed; sketches of rock outcrops; *d.* suits of specimens of rocks and fossils, rocks $3 \times 4 \times 1$ inches.

2. Report on any special formation which may be examined—embracing: *a.* the geographical area of its outcrops; *b.* its mineral character, and origin of the material composing it; *c.* sets and collections of its fossils; *d.* reading of the history of its deposition.

3. Report on any examined deposits of ore or other useful minerals, as: *a.* the magnetic iron ores of New York and New Jersey, phenomena and history; *b.* the limonite ores of the Alleghany belt, character of deposits and age; *c.* the zinc ores of Franklin and Friedensville; *d.* the chromic iron of the Alleghany belt, where and how it occurs.

And on or before May 2, 1887:

A DISSERTATION on one of the following subjects:

(1) The mesozoic sandstones of New Jersey and the Connecticut valley; their geological phenomena, history, and relations to the associated trap rocks.

(2) The limonite ores of the Alleghany belt; their phenomena, age, and origin, *i. e.*, where and how they occur, when and how they are deposited.

(3) *Eozoon Canadense*; is it organic?

COURSE IN ANALYTICAL AND APPLIED CHEMISTRY.

Students of the third class were required to hand to the professor of chemistry, on or before November 1, 1886:

A MEMOIR on one of the following subjects:

1. Biological water analysis.

2. The waxes: their occurrence, chemical composition, preparation, and uses.

3. Nitric acid and nitrates; nitrous acid and nitrites: their occurrence in nature, formation, detection, estimation, and functions.

4. Nitro-compounds in organic chemistry: their nature, formation, properties, and uses.

The memoir must include a general account of the subject, with bibliography, and references to articles in journals.

Students of the fourth class were required to hand in to the professor of chemistry, on or before November 1, 1886:

A MEMOIR on one of the following subjects:

1. The different kinds of glucose and sugar, with special reference to their occurrence, formation, detection, and estimation.

2. Methods for the chemical examination of alcoholic beverages, including simple analysis and the detection of adulterations.

3. Opium, with methods for its analysis.

4. Alkalimetric indicators.

The memoir must contain full references to authorities throughout the text, a table of contents, and an index.

And on or before May 2, 1877,

A THESIS on a subject which they may select, with the approval of the professor of chemistry.

COURSE IN ARCHITECTURE.

Students of the second class were required to hand to the professor of architecture, on or before November 1, 1886, six drawings, as follows:

1. The plans of a small dwelling-house or other building, in brick, wood, or stone, showing at least two stories. The size of the rooms and the thickness of the walls, with the position of the centres of the doors and windows, must be figured in feet and inches.

2. At least two elevations of the above, with a plan of the roof.

3. A perspective drawing either of the above, or of some other building.

4. A plate of mouldings, including string-courses and bases, showing their section, drawn either half or quarter size, with the dimensions figured, or full-size.

5. A plate showing the shadows of the common plane and solid geometrical figures cast upon a vertical plane set at 45° with the vertical plane of projection.

6. A map as specified below.

Students of the third class were required to hand to the professor of architecture, on or before November 1, 1886, six drawings, as follows, illustrations of their second-year work, all to be figured, at least approximately:

1. Doors and windows, plain and decorated, including at least two examples with columns.

2. Chimneys in brick or stone.
3. Cornices, capitals, and bases.
4. Turrets and towers and church-spires.
5. A plate showing the shadows of the common geometrical plane and solid figures upon a vertical plane set at 45° with the plane of projection.
6. A map as specified below.

Students of the fourth class were required to hand to the professor of architecture on or before November 1, 1886, six drawings, as follows, all to be figured, at least approximately:

1. A plate of masonry, including foundations.
2. A plate of ironwork.
3. A plate of carpentry.
4. A plate of joinery.
5. A plate of slating, shingling, tiling, and other roofing.
6. A map as specified below.

These drawings are to be made from the observation of actual examples, and are not to be taken from books. Some of them are to be rendered in line, with the pen or pencil, some with the brush in India ink and color, according to the judgment and skill of each student. These drawings must be carefully figured and lettered, in imitation of printing, Roman or Italic. The third and fourth year drawings will show all the examples in plan, section, and elevation, and also in a perspective sketch. The sketch-books or note-books containing the original memoranda from which the examples presented are selected will form an important part of the work, and will be handed in with the finished drawings for inspection and judgment. In addition to this, each student will bring in a second sketch-book full of sketches.

Students are advised, if practicable, to spend a part of the vacation in an architect's office. They will be furnished with proper letters of introduction by the professor of architecture. Examples illustrating office-work will in this case be accepted in lieu of those mentioned above, except for the plates of shadows and for the maps.

They are also advised to read as much French or German as possible during the summer, and perhaps to subscribe to a French or German newspaper.

Students of the second class will, during the vacation, prepare lists of the chief persons and most important events mentioned in Greek and Roman history, from 1000 B. C. to 500 A. D., making outline maps, drawn or traced, showing

the principal cities and countries. Students of the third and fourth classes will do the same with Mediæval History for the thousand years from Justinian to Charles the Fifth. Any historical works covering these periods will furnish sufficient data. These exercises are a necessary preparation for the studies in the history of architecture that will occupy the next year. The maps will be the sixth of the plates required above.

The memoirs must state from what buildings the examples are taken, pointing out any thing of interest that may be observed in respect either of construction or of design.

The second and third year memoirs will, in addition, contain an appendix, giving definitions of the shapes of the shadows shown upon the fifth plate.

The fourth year memoir will, in five chapters, explain the constructions shown in the plates, embodying especially such information as can be obtained by personal intercourse with workmen and their employers.

The drawings are to be made upon white paper, 15 x 22 inches in size, and the memoirs are to be written upon paper 8 x 10 inches, with a margin of one inch.

VACATION WORK.

During the vacations, at the close of the first and third years, students are required to prepare memoirs on subjects assigned to them by the faculty. Specimens illustrative of the kind of work required in the memoirs have just been given.

During the vacation, between the second and third years, students of the engineering, metallurgical, and geological courses are required to attend the summer class in surveying for study of that subject, and to engage in practical surveying work in the field, under the direction of the adjunct professor of surveying and practical mining.

During the vacation at the end of the second year also, a volunteer class in practical mechanical engineering is usually formed from among the students of either of the engineering courses who have completed their second year, for the purpose of visiting foundries and machine shops in the city, and engaging in practical work and study. This class is under the immediate supervision of the adjunct

professor of mechanical engineering, and is occupied in this way in the month of June.

During the vacation at the end of the third year, a class in practical mining, composed of students in the course of mining engineering, and the course of metallurgy, who have completed the third year, is required to visit mines for practical mine work. The class is under the immediate superintendence of the adjunct professor of surveying and practical mining, and is occupied in this way about six weeks.

During the vacation at the end of the third year, a class in practical geodesy, composed of students in the course of civil engineering who have completed the third year, is required to make a geodetic survey of some region. This includes measuring a base line with a United States Coast Survey secondary base apparatus; secondary and tertiary triangulation with eight-inch theodolite; trigonometric levelling with eight-inch theodolite, with vertical circle; determinations of time, latitude, and azimuth, using portable transit, zenith telescope, and theodolite; approximate determinations of time, latitude, and longitude, with sextant and reflecting circle. The class is under the immediate supervision of the professor of geodesy and practical astronomy.

TEXT-BOOKS.

(The text-books required by the first and second classes are named in connection with the subjects in the synopsis of studies.)

Books preceded by an asterisk (*) are optional—the others are indispensable.

THIRD CLASS.

Peck's *Mechanics* (new edition).

Peck's *Popular Astronomy*.

Davies' *Surveying* (revised edition).

* Publications of the U. S. Coast and Geodetic Survey, relating to the fundamental geodetic operations.

* Davis's *Formulæ for Railroad Earthwork*.

Searle's *Henck's Field-Book for Engineers*.

Gillmore's *Roads and Pavements*.

Stoney's Theory of Strains.
 Rankine's Civil Engineering.
 * Mahan's or Wheeler's Civil Engineering.
 Rankine's Machinery and Mill Work.
 * Callon's Lectures on Mining.
 Egleston's Tables of Weights, Measures, Coins, etc.
 Egleston's Tables for Determining Minerals.
 Egleston's Metallurgical Tables.
 Egleston's Lectures on Mineralogy.
 * Kerl's Metallurgy.
 Ricketts' Notes on Assaying, and Assay Schemes.
 Cornwall's Blowpipe Analysis.
 Plattner's Blowpipe Analysis.
 Cairn's Quantitative Analysis.
 Johnson's Fresenius's Quantitative Analysis.
 Wagner's Chemische Technologie.
 Dana's Manual of Geology.
 Nicholson's Palæontology.
 Von Cotta and Lawrence's Rocks.

FOURTH CLASS.

* Text-book of Least Squares, by Merriman.
 * Wright's Treatise on Adjustment of Observations.
 * Clarke's Geodesy.
 * Helmert's Mathematischen und Physikalischen Theorien der Höher. Geodäsie, two volumes.
 * Jordan's Vermessungskunde, two volumes.
 * Doolittle's Practical Astronomy, as applied to geodesy and navigation.
 * Publications of the U. S. Coast and Geodetic Survey, relating to the fundamental geodetic operations.
 Henck's Field-Book for Engineers.
 Greene's Graphical Statics.
 Weisbach's Mechanics of Engineering.
 Rankine's Civil Engineering.
 Rankine's Prime Movers.
 Rankine's Machinery and Mill Work.
 Rigg on the Steam-Engine.
 Goodeve on the Steam-Engine.
 * Welsh's Designing Valve Gearing.
 Latham's Sanitary Engineering.
 Sewers and Drains for Populous Districts, by J. W. Adams.
 Fanning's Water-Supply Engineering.
 Stevenson on Canals and Rivers.

Stevenson on Harbors.

Parson's Manual of Permanent Way.

* Colyer's Hydraulic Lifting and Press Machinery.

* Röntgen's Thermodynamics, DuBois's translation.

* Planât on Warming and Ventilation.

* Joly, Warming and Ventilation.

Callon's Lectures on Mining.

* Burat's Exploitation des Mines.

* Lottner's Bergbaukunst.

* Rittinger's Die Aufbereitungskunde.

* Gaetschman's Aufbereitung.

* Cotta's Treatise on Ore Deposits, by Prime.

Page's Economic Geology.

Burat's Géologie Appliquée.

D'Orbigny's Palæontologie Élémentaire.

* Whitney's Metallic Wealth of the United States.

Egleston's Metallurgical Tables.

Egleston's Metallurgy of Gold, Silver, and Mercury.

* Kerl's Probirkunst.

* Allen's Introduction to the Practice of Commercial Organic Analyses.

* Berthelot's Leçons sur les Methodes Générales de Synthèse en Chimie Organique.

* Berthelot and Jungfleisch's Traité Élémentaire de Chimie Organique.

* Roscoe and Schorlemmer's Treatise on Chemistry. (Organic Chemistry.)

* Strecker's Short Text-book of Organic Chemistry by Wislicenus.

* Beilstein's Handbuch der Organischen Chemie.

LIBRARY.

The library is open to all officers, students, and graduates, both for borrowing and reference, daily, except Sundays and Good-Friday, throughout the year, including all holidays and vacations.

It now contains 80,000 carefully selected volumes, and additions are constantly made of the best books in all departments, especially of extensive and costly works not readily accessible elsewhere. Nearly 500 different serials, including the leading transactions of societies, periodicals, etc., in all languages, are regularly received, and special effort is made to provide for immediate use, without the formality of asking, the best reference-books in all departments—dictionaries, encyclopædias, indexes, compends, etc.

Each week, the leading American and foreign publications are placed on inspection shelves, and from these all the more valuable are selected and added to the library. About 10,000 bound volumes, and nearly as many more unbound volumes and pamphlets, are now added yearly.

Besides the regular author and title catalogues, there are a minute subject classification on the shelves; a complete subject-catalogue, in a separate book for each class; an exhaustive card-catalogue, with analyses and notes for readers; and a very full printed index of topics. To all catalogues, indexes, and other aids and guides, all students have unrestricted access, day and evening.

A pamphlet giving fuller information about books, building, catalogues and the privileges accorded to readers, will be mailed on application to Melvil Dewey, chief librarian, Columbia College, N. Y.

CABINETS AND COLLECTIONS.

Collections of specimens and models, illustrating all the subjects taught in the school, are accessible to the students, including :

Crystal models.

Natural crystals, pseudomorphs.

Ores and metallurgical products.

Models of furnaces.

Collection illustrating applied chemistry.

Fossils.

Economic minerals.

Rocks.

Olivier's models of descriptive geometry.

Models of mechanical movements.

Models of mining tools.

Models of mining machines.

Casts, antique statuary, animals, etc.

CRYSTAL MODELS.—The lectures on crystallography are illustrated by a collection of 150 models in glass, which show the axes of the crystals and the relation of the derived to the primitive form. This suite is completed by 400 models in wood, showing most of the actual and theoretical forms.

MINERALS.—The cabinet of minerals comprises about 30,000 specimens, arranged in cases. It includes a large suite of pseudomorphs, and a collection illustrating crystallography by natural crystals, showing both their normal and distorted forms. The minerals are accompanied by a large collection of models in wood showing the crystalline form of each. Arranged in wall cases are large specimens, showing the association of the minerals.

ORES AND METALLURGICAL PRODUCTS.—A very complete collection of metallurgical products, illustrating the different stages of the type process in use in the extraction of each metal in this country, and in Europe, is accessible to the students. This collection is constantly increasing. Most of the specimens have been analyzed and assayed.

MODELS OF FURNACES.—An extensive collection of models of furnaces has been imported. A very large number of working drawings of furnaces and machines used in the different processes is always accessible to the students.

APPLIED CHEMISTRY is illustrated by several thousand specimens of materials and products arranged in a cabinet of industrial chemistry, for exhibition at the lectures and for inspection by the students.

THE GEOLOGICAL COLLECTION consists of over 100,000 specimens (to which additions are constantly made), forming the following groups:

1st. A systematic series of the rocks and fossils charac-

teristic of each geological epoch, numbering over 70,000 specimens.

2d. A collection of ores, coals, oils, clays, building materials, and other useful minerals, illustrative of the course of lectures on economic geology, and believed to give the fullest representation of our mineral resources of any collection yet made.

3d. A collection of 5,000 specimens of rocks, and the minerals which form rocks, to illustrate the lectures on lithology.

4th. A palæontological series, which includes collections of recent and fossil vertebrates, articulates, mollusks, radiates, and plants. In this series is to be found the largest collection of fossil plants in the country, including many remarkably large and fine specimens, and over 200 species of which representatives are not known to exist elsewhere. Also, the most extensive series of fossil fishes in America, including among many new and remarkable forms, the only specimens known of the gigantic *Dinichthys*; a suite of Ward's casts of extinct saurians and mammals; fine skeletons of the great Irish elk, the cave bear, the New Zealand moas, *ichthyosaurus*, *teleosaurus*, etc.

5th. Several hundred maps and diagrams illustrating the course of instruction; lanterns, microscopes, and over 2,000 slides to be used with them.

DRAWING MODELS.—There are, for the use of students, a large collection of flat models and of plaster casts; the Olivier models, forming all mathematical surfaces by silk threads, and admitting of a variety of transformations; also other models, illustrating general and special problems of descriptive geometry, shades and shadows, and stone-cutting; photographs of plaster casts and of parts of machines, for use in free-hand drawing; drawings of machines and parts of machines for studying and copying; also, landscapes in crayon and in water-color for instruction in sketching; models of mining machines and mining tools, stationary steam-engines, single and double cylinders, sections of steam-cylinders, water-wheels, turbines, shaking tables, stamps, crushers, blowing machines, pumps, etc.

CIVIL ENGINEERING is illustrated by a collection of models of beams, beam joints, roof and bridge trusses, masonry, doorways, arches, walls, culverts, bridges, and canal locks; working models of overshot, breast, undershot, and different kinds of turbine water-wheels; a machine, made by Fairbanks & Co., for testing the strength of materials; a five-inch condensing steam-engine, with a stroke of six inches; horizontal, vertical, and sectional steam-engines and valves, etc.

There have been recently added to the department of engineering, for the use of students in geodesy, two four-metre compound bars with Borda's scales, etc., for measuring base lines; one standard four-metre bar; one eight-inch theodolite with horizontal and vertical circles for measuring horizontal angles and double zenith distances.

MINING ENGINEERING is illustrated by models of blowing engines, ventilators, mine shafts, tunnels, galleries, methods of walling, methods of tubbing shafts, methods of measuring shafts, shaft house, hoisting engine, safety cages, man-engines, ladders, shaking tables, washers, stamps, crushers, mining machines, lamps and tools, artesian well-borer, blasting apparatus, etc.

Additions to the various collections are constantly made.

ASTRONOMICAL OBSERVATORY.

The astronomical observatory contains a set of portable astronomical instruments; a forty-six-inch transit, by Troughton & Simms; a combined transit and zenith instrument for time and latitude determinations; an equatorially mounted refractor of five inches aperture, to which is attached a spectroscope with the dispersive power of twelve flint-glass prisms of fifty-five degrees, by Alvan Clark; also a diffraction spectroscope with grating, by L. M. Rutherfurd, Esq.

A set of comparison apparatus, with electrodes, Plucker's tubes, coils, etc., accompanies the spectroscope.

Instruction in practical astronomy is given in the observatory to students of the third and fourth classes in the course of civil engineering.

By the gift of Mr. Rutherfurd there has been added to the observatory equipment: (1) An equatorial refracting telescope of thirteen inches aperture supplied with a correcting lens for photographic work. With this instrument belong two micrometers for position measurements. (2) A transit instrument of three inches aperture by Stackpole & Brother. (3) A Dent sidereal clock. (4) A micrometer for measuring photographic plates, and sundry other pieces of apparatus. These gifts of Mr. Rutherfurd increase the value of the instruments in the observatory by about \$20,000. The observatory has a fine mean-time clock by Howard & Co., also a chronograph by Fauth & Co., a personal equation machine, etc. The observatory is lighted by electricity.

JOHN TYNDALL FELLOWSHIP FOR THE ENCOURAGEMENT OF RESEARCH IN PHYSICS.

In June, 1885, Professor John Tyndall, of London, presented to the college \$10,800 for the encouragement of scientific research.

The trustees accepted the gift, and adopted the following resolution :

Resolved, That with the view of carrying into effect the intent and purpose of the said John Tyndall in making this donation, the following regulations are hereby adopted :

1. A fellowship is hereby established in Columbia College entitled the John Tyndall Fellowship for the Encouragement of Research in Physics, to be held by some suitable person, who shall be either a graduate or a student in some department of Columbia College, but not necessarily a candidate for a degree.

2. The holder of the fellowship shall be nominated by the president and the faculty of the School of Mines, and appointed by the Board of Trustees. Such appointment shall be for the term of one year only, but the fellow, for the time being, shall be eligible for appointment from year to year upon the recommendation of the president and faculty of the School of Mines.

3. The fellow so appointed shall be entitled to receive during his term of office the net income of the capital sum constituting the endowment, to be paid him in four equal quarterly instalments at the usual times of paying college officers, and the trustees of Columbia College guarantee that such net income will amount to at least \$648 a year, being six per cent. upon \$10,800, the fund presented to the college by Professor Tyndall.

4. It shall be the duty of the fellow so appointed to devote himself faithfully to the investigation of some subject

in physical science, at this college or at some other in this country or abroad, under the supervision and direction of some known physicist approved by the president and the faculty of the School of Mines.

5. It shall be the duty of the said fellow to make a report quarterly to the president, giving an account of the work in which he has been engaged during the three months preceding; which report shall be certified by the physicist superintending and directing him.

6. In case of failure faithfully to fulfil the obligations imposed upon him, the said fellow shall forfeit all privileges and emoluments conferred upon him by his appointment to the fellowship, and on report by the president of such delinquency, the Board of Trustees may at any time declare the said fellowship to be vacant.

7. The foregoing regulations may at any time be altered or modified in any particular not in conflict with the deed of gift.

DEGREES.

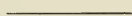
Those who complete the required course of studies will receive the degree of engineer of mines, civil engineer, metallurgical engineer, or bachelor of philosophy.

Graduates of the school who pursue, at the school, for not less than one academic year, a course of study prescribed by the faculty, pass a satisfactory examination thereon, and present an acceptable dissertation embodying the results of such special study upon an approved subject, receive the degree of doctor of philosophy.

CALENDAR.

- 1887—June 3.—Examinations for admission begin, Friday.
Sept. 27.—Examinations for admission begin, Tuesday.
Oct. 3.—First term begins, Monday.
Nov. 8.—Election day, holiday.
Nov. —Thanksgiving day, holiday.
Dec. 26.—Christmas recess begins, Monday.
- 1888—Jan. 9.—Lectures resumed, Monday.
Jan. 30.—Examinations begin, Monday.
Feb. 8.—First term ends, Wednesday.
Feb. 9.—Second term begins, Thursday.
Feb. 15.—Ash-Wednesday, holiday.
Feb. 22.—Washington's birthday, holiday.
Mar. 30.—Good-Friday, holiday.
Apr. 2.—Easter-Monday, holiday.
May 21.—Annual examinations begin, Monday.
June 8.—Examinations for admission begin, Friday.
June 13.—Commencement, Wednesday.

COLUMBIA COLLEGE



SCHOOL OF LAW

COURSE OF STUDY, ADMISSION, ETC.

GENERAL STATEMENT.

There are five professorships in the School of Law, viz.:

1. Law of Contracts, Maritime and Admiralty Law.
2. Real Estate and Equity Jurisprudence.
3. Criminal Law, Torts and Procedure.
4. Constitutional History, International and Constitutional Law, and Political Science.
5. Medical Jurisprudence.

The course of study occupies two years, and is so arranged that a complete view is given during each year of the subjects pursued. The plan of study comprises the various branches of common law, equity, commercial, international, and constitutional law, and medical jurisprudence. The first year of the course is devoted to the study of general commentaries upon municipal law, and contracts, and real estate. The second year includes equity jurisprudence, commercial law, the law of torts, criminal law, evidence, pleading, and practice. Lectures upon constitutional law and history, political science, and international law are delivered through both the senior and junior years. Those on medical jurisprudence are delivered to the senior class.

In the department of municipal law, each class is divided into two divisions. This arrangement is made to meet the convenience of students. Any student may join either division of his class as he may prefer. Ten hours are occupied with this department in each week. Attendance at these lectures is expected, and is compulsory. One division of the senior class is in session from 9:30 to 11 A.M.; the other from 4:30 to 6 P.M. One division of the junior class is in session from 11 A.M. to 1 P.M.; the other from 3 to 4:30 P.M. All applications for absence are to be made to the warden.

Attendance at the other lectures delivered in the school is

optional. It is, however, strongly recommended as in a very high degree useful. The trustees of the college have marked their sense of the importance of the study of constitutional history and public law by making a distinction, to be hereafter more fully stated, in the degree received by those who faithfully pursue it.

By the courtesy of the faculty of the School of Medicine, law students may, on special application to the warden for a permit, attend any or all the courses of medical lectures free of charge.

The school is situated in East Forty-ninth street, between Madison and Fourth avenues, upon the same block with the School of Arts, the School of Mines, and the School of Political Science.

ADMISSION.

Applicants for admission are divided into two classes—those who are and those who are not candidates for a degree.

The admission of applicants who are candidates for a degree is regulated as follows: All graduates of literary colleges are admitted without examination. Other candidates must be examined. There are two kinds of examination, one of which is regular and the other substitutionary.

1. *Regular examination.*—Candidates must be at least eighteen years of age, and have received a good academic education, including such a knowledge of the Latin language as is required for admission to the freshman class of the School of Arts. The examination for admission is held upon the outlines of Greek and Roman history, as well as that of England and of the United States, upon English grammar, rhetoric, and the principles of composition, Cæsar's Gallic War entire, six books of Virgil's *Æneid*, and six orations of Cicero, or other Latin authors deemed by the examiner to be equivalent to the above. The examination is conducted by an examiner, an alumnus of the college, who is appointed by the committee of the Board of Trustees on the School of Law. It is held in the law school building, on the Saturday next preceding the first Monday in October, at 10 o'clock A.M., and is both oral and in writing. Special arrangements for examination are made in behalf of applicants who are unable to attend at the regular time.

Where any person thus examined is found to be well grounded in the principles of the Latin language, but has

not read the entire amount required by the above rules, he may be admitted at the discretion of the faculty, conditionally, as a candidate for a degree. If such deficiency is not made good in one year, he may be allowed to join the next junior class upon new conditions.

2. *Substituted examination*.—Any applicant for a degree may pass, instead of the regular examination, a “regents” examination.” This is made necessary by the rules of the Court of Appeals of the State of New York, for all students who apply for admission to the bar. It is an examination prescribed by the regents of the University of the State of New York, and embraces such subjects as arithmetic, English grammar, geography, orthography, American history, English history, and English composition. A copy of the regulations of the regents, not including the examination papers themselves, can be obtained from the secretary on application at the law school building or by letter. A copy of the regents’ certificate should be supplied to the secretary as evidence that the examination has been passed.

Applicants who are not candidates for a degree are admitted without a preliminary examination. Their names are published in the catalogue as members of the class to which they may be attached, in accordance with the topics they may elect to pursue.

All applicants for admission must be of good moral character.

FEES.—The tuition fee is \$150 per year, payable one half at the beginning and the other half at the middle of the year. The payment of the tuition fee, as above stated, is a prerequisite to attendance upon the exercises. Payment is to be made to the college treasurer; and on production of a certificate of payment from him, the student is expected to enter his name in a register, kept in the office of the secretary for that purpose. In special cases, when the student’s means are limited, the facts may be brought to the attention of the warden, who will supply him with information as to the mode of making an application to the proper authorities for reduction of the tuition fees to an amount not less than one hundred dollars. This payment admits a student to all the lectures and to the use of the college library, and to all the courses in the School of Political Science, without any fee, except a matriculation fee of \$5. No student is matriculated until his fees are paid. The fee for matriculation is \$5 in each year, payable before registration. The fee for

degree is \$25. Board may be obtained in the city at prices ranging from \$5 to \$7 a week. Rooms are obtained at prices ranging from \$3 to \$5 a week. Where two students room together, board and rooms may be obtained at moderate terms.

SCHOLASTIC YEAR.

The scholastic year commences on the first Monday of October and continues for eight calendar months. Students should be in attendance on the Friday and Saturday preceding the opening of the year to make the necessary preparations for the lectures.

DEPARTMENTS OF INSTRUCTION.

For the purpose of presenting the subjects of instruction in the various departments with clearness, the professorships may be grouped into three classes, viz.: Those appertaining to municipal law, numbered, on page 155, (1), (2), and (3); the professorship of constitutional law, etc., numbered (4); and the professorship of medical jurisprudence, numbered (5).

MUNICIPAL LAW.

In the subjects embraced within the scope of the first three professorships the methods of instruction are substantially the same, and are designed to afford a complete course of legal education for gentlemen intended for the bar in any of the United States, except in matters of mere local law and practice.

The leading end sought to be accomplished is the thorough and careful training of the student. He is led to look for the leading principles of law without encumbering himself with a search for minor details. To this end he is expected to familiarize himself with definitions, and to become practised in deducing, from general principles, rules to govern specific cases that are from time to time presented to him. The instruction in the class-room presupposes that he has given careful attention to the subject, and to a certain extent grappled with its difficulties. With this view a topic is assigned to him from some approved text-book. He is

questioned upon it for the purpose of determining the extent to which he has grasped the principles involved. Accompanying the question is a full oral exposition from the professor in charge of the class, with suitable illustrations from decided cases. The exercise is made familiar and the student is encouraged to state his difficulties and to ask explanations on such points as still remain obscure. It will be observed that this system excludes, in the main, lectures in the ordinary sense. It is rather a system of questions, expositions, and dictations. However, in some branches, *e. g.*, criminal law, lectures, as ordinarily understood, are resorted to. But of these lectures a comprehensive synopsis, embracing the general principles of criminal jurisprudence, is dictated to the students, to be preserved for study and reference.

The student is not required to go over the subjects prescribed in the Law School curriculum but once, except for purposes of review. Large numbers of the students, however, who have pursued the studies in the junior class, voluntarily, and at the discretion of the faculty, attend exercises of that class during the senior year, in this way hearing the expositions for a second time. This course is found to be highly useful in giving a better appreciation of legal distinctions and fixing leading principles in the memory.

The student is also encouraged, after he has made some acquaintance with general legal rules, to read and carefully study leading cases, so as to observe the application of principles to practical affairs. A large number of students attend law offices, and thus combine practical with theoretical instruction. It may be well questioned whether this course is, in general, wise. It would seem to be most open to objection during the first year of the course. The office business is then but little understood or its significance appreciated. After a year's course, the meaning of office work is better comprehended, and the details of business are much more rapidly acquired. It is believed, however, that the wisest course in general is, during the scholastic year, to devote the entire time to the prescribed studies and those of a kindred nature. When this work has been thoroughly done, another year may profitably be devoted to office business as a preliminary to admission to the bar.

MOOT-COURTS.—The design of these is to aid in training the student to discuss debatable questions of law. It has not been found practicable to make use of these fictitious

tribunals for the trial of disputed questions of fact, either with or without a jury. The theory on which they are conducted is that the facts are assumed to be true, and the only subject open to debate is the rule of law to be applied to them. The discussion involves the preparation of written points, in which the rules of law are stated under appropriate divisions and sustained by authorities, and the oral discussion of such points before classmates and a presiding professor. The brief, when properly prepared, is practically identical with one suitable for argument in an appellate court. Six or eight students are selected to conduct the argument, after which the case is closed by a decision from the presiding professor, given a week subsequently. A special instructor is provided to give instruction in the preparation of briefs and the proper use to be made of legal authorities.

These discussions are strongly recommended to students. They serve as a direct training for regular work in the profession. It is found that large numbers of graduates of colleges attending the school have had little or no experience in oral discussion. A success in this direction is, however, of the greatest consequence to the practitioner. Many young men, for the first time in their lives, resort in these courts to oral argument, overcome in the presence of their classmates their natural diffidence, and are ready for the transaction of actual business when it comes to them. Students who are not assigned to take part in the discussion find it of great importance to study the case with care, and thus to prepare themselves for an intelligent appreciation of the arguments made in their hearing.

Two moot-courts are held each week, and printed slips containing the case to be discussed are given out in advance to the whole body of students.

It is also strongly recommended to the students to form clubs for the discussion among themselves of the same cases which are presented in the regular moot-courts. Several such clubs are now in successful operation. Another useful exercise, kindred in its nature, is the informal debate among themselves of disputed points arising from day to day in the class-room.

The trustees of the college have established a series of prize tutorships. It is a part of the official duty of the tutors to question the students upon subjects already studied, with a view to fixing leading topics in the memory. This exercise is found to be very useful, and is highly val-

ued by the students. Two evenings per week are devoted to these exercises.

There has also been provided for the current year instruction in Norman French, with a view of enabling students to read the books of the English law in that language still untranslated. This is an experiment, and the instruction will be continued if the demand for it is found sufficient.

CONSTITUTIONAL HISTORY, INTERNATIONAL AND CONSTITUTIONAL LAW, AND POLITICAL SCIENCE.

In this department, three lectures and one recitation per week with each class are given throughout two years. The subjects treated are as follows, and in the following order:

(A) General political and constitutional history, comprehending in detail: A view of the political civilization of imperial Rome; the history of the development of the government of the Christian church into the form of papal monarchy; the overthrow of the Roman imperial system and the establishment of German kingdoms throughout middle, western, and southern Europe; the character and constitution of these kingdoms; the conversion of the Germans to the Christian church, and the relations which the Christian church assumed toward the Germanic states; consolidation of the German kingdoms into the European empire of Charlemagne; character and constitution of the Carloviagian state; its disruption through the development of the feudal system and the independent hierarchic church, and division into the kingdoms of Germany, France, and Italy; character and history of the feudal system as a state form; re-establishment of the imperial authority by the reconnection of Germany with Italy; conflict of the middle ages between church and state; the political disorganization and papal despotism resulting from the same; the development of the absolute monarchy and the reformation; the limitation of absolute kingly power and the development of constitutionalism—first in England, then in the United States, thirdly in France, and fourthly in Germany; lastly, the realization of the constitutional idea of the nineteenth century.

(B) Comparative constitutional law; comprehending a comparison of the provisions of the constitutions of England, United States, France, and Germany, the interpretation of the same by the legislative enactments and judicial

decisions of these states, and the generalization from them of the fundamental principles of public law, common to them all.

(C) The history of diplomacy, from the peace of Westphalia to the treaty of Berlin. The object of this course is to present the international treaties and conventions occurring between these two periods in their historical connections, and to trace through them the development of the principles of international law.

(D) International law, in which course the principles attained through usage, treaty, and convention are arranged in systematic form.

(E) The fundamental principles of political science, as a generalization from the foregoing investigations.

MEDICAL JURISPRUDENCE.

In this department, the object is to show the relations between the great departments of medicine and law, and the points at which these sciences touch each other. This is done solely through the medium of lectures, on which no examinations are held. The course embraces the following subjects: medical jurisprudence, including personal and medical relations, physically considered; poisons, wounds, and exceptional forms of death; insanity, and its bearings, civil as well as criminal, on legal responsibility; malpractice on the part of physicians and surgeons; medical evidence, coroners' courts, life insurance, and survivorship. A preliminary course of lectures upon anatomy is also delivered by the professor.

BOOKS OF REFERENCE IN THE SEVERAL DEPARTMENTS.

The professors recommend from time to time books of reference on the subjects under their care. These in the department of municipal law cover a very wide range, so that it would be inconvenient here to enumerate them. It will only be possible to refer to them by classes, as *e. g.*, text-books, reports, and digests, mentioning a few that are very prominent in each class. The main source of detailed knowledge of jurisprudence is the reports of cases as they are from time to time decided, it being a legal rule, subject to exceptions, that a decision of a high court upon certain facts is authority or precedent for deciding a later case arising in the same jurisdiction upon the same general state of facts. Decisions in other states may be also used as

arguments, though not strictly as authority. The most important and valuable reports are those of the highest appellate courts in one's own state or in sister states or in England. The most convenient index to the reports is a "digest." This contains a brief synopsis of the cases detailed at length in the reports. Fisher's Digest of English Law (Jacobs' ed.) is to be recommended. Among American books of this class may be noticed the United States Digest, containing a collection of cases decided throughout the country, so far as reported; Abbott's National Digest of Decisions in the Federal Courts; Brightly's National Digest of Decisions in the Federal Courts; and local digests of the law of each state. The law of New York is found digested in Abbott's New York Digest and in Brightly's Digest.

Text-books are extremely numerous. Prominent among them are Coke's Institutes; Blackstone's Commentaries (editions of Chase, Sharswood, or Cooley); Kent's Commentaries; Chitty on Contracts; Pollock on Contracts; Parsons on Contracts; Story's works on special branches of the law, *e. g.*, Bailments, Agency, Bills of Exchange and Promissory Notes, and Equity; Bispham's Principles of Equity; Byles on Bills; Chitty on Bills; Paley on Agency; Lindley on Partnership; Parsons on Partnership; Benjamin on Sales; Sedgwick on Damages; Mayne on Damages; Cruise's Digest of the Law of Real Property; Washburn on Real Property; Jones on Mortgages; Fisher on Mortgages; Powell on Mortgages, with notes; Fearne on Remainders; Lewin on Trusts; Perry on Trusts; Hill on Trustees; Lewis on Perpetuities; Addison on Torts; Cooley on Torts; Bishop's works on Criminal Law, Criminal Procedure, Marriage and Divorce, etc.; Cooley's Constitutional Limitations; Shearman & Redfield on Negligence; Stephen's Digest of Evidence (Chase's edition); Greenleaf on Evidence; Phillips on Evidence; Stephen on Pleading; Codes of Procedure, etc.

The text and reference books used in connection with the regular courses on political history, public law, and political science, are: Ortolan's Roman Law; Wietersheim's *Geschichte der Völkerwanderung*; Rückert's *Culturgeschichte des deutschen Volks*; Bryce's *Holy Roman Empire*; Kitchin's *Political History of France*; Waltz's *Deutsche Verfassungsgeschichte*; Gregorovius's *Geschichte der Stadt Rom im Mittelalter*; Ranke's *History of the Popes and of Europe generally in the Period of the Reformation*; Stubbs'

Constitutional History of England ; Hallam's Constitutional History of England ; May's Constitutional History of England ; Molesworth's Political History of England ; Martin's Histoire de France ; Von Sybel's Geschichte der Revolutionszeit ; Alison's History of Europe ; Bancroft's History of the United States ; Curtis's History of the Constitution ; The Federalist ; Von Holst's Democracy and Constitution in the United States ; Neumann's Geschichte der Vereinigten Staaten von Nord America ; Fisher's Trial of the Constitution ; Jennings's Eighty Years of Republican Government in the United States ; Gervinus's Geschichte des neunzehnten Jahrhunderts ; Bowyer's Constitutional Law of England ; Fischel's English Constitution ; Bagehot's English Constitution ; Cox's English Institutions ; Von Rönne's Verfassung und Verfassungsrecht des deutschen Reichs ; Von Holtzendorf's Jahrbuch der Gesetzgebung des deutschen Reichs ; Gneist's Englisches Verwaltungsrecht ; Gneist's Self-Government in England ; Rivière's Codes de France ; Bard & Robiquet's Droit Constitutionnel de France ; Story's Constitutional Law of the United States ; Paschal's Annotated Constitution of the United States ; United States Supreme Court Reports ; Martens' Recueil des Traités de la Paix ; Ghillany's Diplomatisches Handbuch ; Scholl's Histoire Abrégé des Traités de la Paix ; Flassau's Histoire de la Diplomatie Française ; Martens' Causes Célèbres du Droit des Gens ; Klüber's Europäisches Völkerrecht ; Bluntschli's Europäisches Völkerrecht ; Heffter's Europäisches Völkerrecht ; Calvo's Droit International ; Phillimore's International Law ; Wheaton's International Law ; Woolsey's International Law ; Bluntschli's Lehre vom modernen Staat ; Zacharia's Vierzig Bücher vom Staat ; Von Holtzendorf's Principien der Politik ; Brougham's Political Philosophy ; Broom's Philosophy of Law ; Bowyer's Commentaries on Universal Public Law ; Woolsey's Political Science.

The reference books on medical jurisprudence are : Wharton and Stillé's Medical Jurisprudence ; Taylor's Principles and Practice of Medical Jurisprudence ; Beck's Medical Jurisprudence ; Taylor on Poisons ; Ray's Medical Jurisprudence of Insanity ; Ordronaux's Jurisprudence of Medicine ; Ordronaux's Judicial Aspects of Insanity.

LIBRARY.

The law library contains a complete series of the reports and statutes of the United States and of New York; full sets of the reports of nearly all the other states, with statutes and digests; a full series of the English and Irish reports from the Year-Books to the present time, with the English and Irish statutes and digests; the leading treatises on English and American private law; the best editions of the Roman civil law and the leading commentaries on it, both ancient and modern; and the codes, legislative acts, and special treatises on the law of Germany, France, Italy, and other nations, including the South American States.

It includes the original law library of William Samuel Johnson, the first president of Columbia College after the revolution, and one of the framers of the constitution of the United States; also the law library of John Jay, the first chief-justice of the United States.

The library is especially rich in international, constitutional, and administrative law, and in political history, politics, and the economic sciences. Some 5,000 volumes of the most valuable European and American works were bought with the advice and assistance of eminent American and English publicists and professors.

Constant additions of current publications and the more important older works not already included have enlarged the library of law and political science to over 17,000 volumes.

In 1883 the six libraries of Columbia College were consolidated into one collection, and moved into the new library building, immediately connected with the new law school building. Law students use and borrow books for home reading from the entire collection. The whole east wing of the large reading-room is reserved for their use; and there are also private reading-rooms to which admission is given by ticket, thus affording special opportunities for study to those who are preparing theses, or doing other work requiring a number of volumes to be kept for some time on a private table.

Students are allowed to consult the shelves directly, and members of the library staff are especially assigned to aid readers in the law department.

The library and reading-rooms are all open both for bor-

rowing and reference from 8 A.M. to 10 P.M. every day (except Sundays and Good Friday) throughout the year, including vacations and legal holidays.

A special pamphlet with fuller information is published by the library, and will be mailed on application to Melvil Dewey, chief librarian, Columbia College, N. Y.

PRIZES.

I.—IN THE DEPARTMENT OF MUNICIPAL LAW.

Prize tutorships.—There have been established in this department three prize tutorships of \$500 each, annually, which continue for three years. The first of these was awarded in 1883; a second in 1884, and a third in 1885, and subsequently one will be awarded in each year to fill the place of one whose term of office shall expire. The appointments are made on the recommendation of the faculty from the members of the graduating class who excel in general proficiency and attention to the study of the course.

Money prizes.—A series of prizes in money has been established to be awarded to such members of the school as shall have attained the highest excellence in their respective classes. Three such prizes are given in the department of municipal law. They were first awarded in 1860, and are continued annually. Competitors for these prizes must have pursued the full course of study prescribed by the rules of the school.

The sums awarded in this department are, for the first prize, two hundred and fifty dollars; for the second prize, one hundred and fifty dollars; for the third prize, one hundred dollars. The degree of bachelor of laws, "*cum laude*," is also conferred upon those who receive the prizes, as well as upon those of whom honorable mention is made by the committee of award.

The rules governing the examination for the three prizes of two hundred and fifty dollars, one hundred and fifty dollars, and one hundred dollars are subjoined:

1. There shall be an examination of the candidates for prizes at the close of each scholastic year. The examination will occur on a day to be announced by the warden.

Candidates must have been connected with the School of Law for two scholastic years, and must have attended with general regularity the courses of lectures upon municipal law. An attendance upon lectures of the other courses is not a prerequisite.

2. The test of excellence shall be twofold :

a. By an examination in writing, in answer to printed questions.

b. By essays prepared upon such legal topics as may be assigned.

The prizes shall be adjudicated upon the combined excellence of the essays and of the examinations. Diligence and regularity of attendance upon the prescribed exercises of the school shall also form an element in reaching the conclusion.

3. The following directions must be observed by the candidates in preparing essays.

a. The essays shall be written on white commercial letter-paper of the best quality, with a margin of an inch wide. Only two pages of each sheet shall be written upon. The chirography must be plain and legible. The essay shall not exceed ten sheets or twenty pages in length.

b. The positions taken in the essays shall, if debatable, be fortified by the citation of authorities. Where the point is reasonably well settled, a single decisive and leading authority will suffice. In other cases more are admissible.

c. Conciseness and clearness of expression, accuracy of statement, and close reasoning should be carefully studied by the essayist.

d. Each essay must be signed with a fictitious name, and accompanied by a sealed envelope, upon the outside of which shall be written the fictitious name attached to the essay, and within a slip of paper containing the real name of the author. The essay shall be delivered to the warden on a designated day, on or before the last Friday in April. The essays shall belong to the college.

4. The examination upon the printed questions shall be as follows :

a. Those who intend to compete for the prizes shall enter their names in a book provided for that purpose upon the day of examination. If among these persons there are any who have been wanting in a reasonable degree of punctuality, they shall be informed before examination that they may fail to obtain the prize.

b. The warden shall call a session of the candidates at

such a time, near the close of the scholastic year, as may be convenient. He shall furnish at the opening of the session the printed papers to the students, who shall write their answers in the presence of one of the professors, upon paper similar to that provided for the essays, with similar margin. During this session there shall be a general silence observed, except in regard to such necessary questions as may be addressed to the professor in attendance, and there shall be especially no communication of the candidates with each other respecting answers. A failure to observe these rules will work a forfeiture of the right to receive a prize.

c. Each set of answers to the printed questions shall be signed by the candidate with the fictitious name attached to his essay, and at the close of the session shall be handed to the professor presiding. The answers shall belong to the college.

5. The essays and answers shall thereupon be transmitted to a committee on prizes, consisting of three members of the legal profession, who are to be selected by the committee of the Board of Trustees on the School of Law. The report of this committee will be communicated to the warden in writing.

6. The names of the successful candidates will be announced at the commencement.

7. The warden must countersign all drafts upon the treasurer before they can become available.

II.—IN THE DEPARTMENT OF CONSTITUTIONAL LAW, ETC.

A prize or prizes of one hundred and fifty dollars, founded by Robert N. Toppan, Esq., are awarded in this department.

The candidates are expected to write on a specified day answers to questions submitted by the professor in charge of the department.

A regular attendance upon the course of municipal law is a prerequisite to competition.

The degree of bachelor of laws, "*cum laude*," is conferred upon successful candidates, and also upon those who receive honorable mention from the committee of award.

DEGREES AND CERTIFICATES.

An examination for degrees is held at the close of the senior year, and extends over all the studies of the course.

The degree of bachelor of laws (LL.B.) will be conferred upon such students as shall have pursued, to the satisfaction of the trustees of the college and the faculty, the entire course of study, and shall have passed the required examination.

Students who shall add to the study of municipal law, the courses of instruction and recitation upon constitutional history and constitutional law, diplomatic history and international law, in their prescribed order, and shall pass approved examinations therein, will receive the degree of bachelor of laws, "*cum laude*." This rule is also extended to those to whom prizes in either department are awarded, or of whom honorable mention shall be made by the committee of award. If a student at the time of graduating has not attained the age of twenty-one years, the delivery of his diploma may be deferred until he attains that age.

When a person remains connected with the school for a period not entitling him to graduate, he may, on application to the warden, receive, instead of a diploma, an official certificate of attendance, which states the time of his attendance and the degree of his attainments.

ADMISSION TO THE BAR.

Formerly, and for many years, the student, on graduating, was admitted to the bar of the State of New York without an additional examination. This is no longer the case. By the provisions of the Amended Code of Procedure of that state (chapter 448 of the laws of 1876), the Court of Appeals is empowered to make general rules regulating admission to the bar. In pursuance of these provisions, general rules have been adopted by the court, superseding former methods of admission. These are subjoined in full:

RULES IN COURT OF APPEALS.

Ordered that the following amended rules for the examination and admission of persons to practise as attorneys

and counsellors in courts of record in this state be, and the same are hereby adopted, in pursuance of the provisions of the Code of Civil Procedure, all the judges concurring,—such rules to take effect July 1, 1882.

I.

No person shall be admitted to practise as an attorney and counsellor in any court of record in this state, except as provided in these rules, without a regular admission and license by the Supreme Court at a general term thereof, after a satisfactory examination conducted by the judges of such court, or by not less than three practising lawyers of at least seven years' standing at the bar, to be appointed by the court for one year at the first general term, held in each year in the respective departments. The members of such committee of examination may be removed at any time by the court, and vacancies for any cause or non-attendance may be filled during the year.

II.

Before any person shall enter upon the clerkship or substituted course of study hereinafter provided, or within three months thereafter, he shall, if not a graduate of a college or university, pass a regents' examination, conducted under the authority and in accordance with the rules and regulations of the Board of Regents of the University of the State of New York, in arithmetic, grammar, geography, orthography, English and American history, and English composition, and shall file a certificate of such fact, signed by the secretary of the Board of Regents, and countersigned by the principal or teacher conducting such examination, in the office of the clerk of the Court of Appeals, who shall, upon filing the same, return to the person named therein a certified copy of the same, showing the date of such filing; but this rule shall not apply to students whose clerkship or substituted course of study began before the adoption of these rules.

(NOTE.—Examinations in the subjects required by this rule are held by the regents in all the academies and academic departments of union schools in the state, under regulations issued from their office in Albany. Special provision is and will be made for meeting the requirements of this rule.)

III.

No person shall be admitted to practise as an attorney and counsellor unless he shall have served a regular clerkship of three years in the office of a practising attorney of the Supreme Court, after the age of eighteen years, except as hereinafter provided. An allowance of one year shall be made to applicants who are graduates of any college or university. Any portion of time, not exceeding one year for graduates receiving the foregoing allowance, and two years for other applicants, actually spent in regular attendance upon the law lectures or law school connected with any college or university having a department organized with competent professors and teachers, in which instruction is regularly given, shall be allowed in lieu of an equal period of clerkship in the office of a practising attorney of the Supreme Court, but in no case shall an applicant be entitled to admission as an attorney and counsellor without having served a clerkship in the office of a practising attorney of the Supreme Court for the period of at least one year.

Attendance at a law school during a school year, as the same existed previous to the adoption of these rules, and hereafter for a period or term not less than eight months in any year, shall be deemed a year's attendance under this rule, and in computing the period of clerkship a vacation not exceeding three months in each year shall be allowed as part of such year.

IV.

To entitle an applicant to an examination as an attorney and counsellor, he must prove to the court :

First. That he is a citizen of the United States, twenty-one years of age, and a resident of the department within which the application is made, and that he has not been examined in any other department for admission to practise and been refused admission and license within three months immediately preceding, which proof may be made by his own affidavit.

Second. That he is a person of good moral character, which may be proved by the certificate of the attorney with whom he has passed his clerkship, or by some attorney in the town or city where he resides, but such certificate shall not be conclusive, and the court must be satisfied on this point from examination and inquiry.

Third. That, before commencing this clerkship or substituted course of study, he had graduated at a college or

university, or, if not such graduate, that, before commencing such clerkship or substituted course of study, or within three months thereafter, he had passed the regent's examination hereinbefore required, which facts respectively may be proved by the production of the diploma of such college or university, or, in case of its loss, by other satisfactory proof, and by a production of a certified copy of the regent's certificate filed in the office of the clerk of the Court of Appeals, as hereinbefore provided.

Fourth. That he has served the clerkship or pursued the substituted course of study prescribed by the rules. The clerkship may be proved by the certificate of the attorney with whom the same was served, or, in case of his death or removal from the state, or unjust refusal to give the same, by other satisfactory evidence. The time of study, allowed as a substitute for any part of said clerkship, may be proved by the certificate of the teacher or president of the faculty under whose instructions the person has studied, in addition to the affidavit of the applicant ; which proof must be satisfactory to the court.

V.

It shall be the duty of attorneys, with whom a clerkship shall be commenced, to file a certificate of the same in the office of the clerk of the Court of Appeals. The clerkship shall be deemed commenced from the time of such filing, and a certified copy of the certificate, and of the filing, shall be produced at the time of the application for examination.

VI.

Persons who have been admitted as attorneys in the highest court of original jurisdiction of another state or country, may be admitted to examination as attorneys and counsellors, if they have served a regular clerkship of one year in the office of a practising attorney of the Supreme Court of this state, and shall in other respects be entitled to such examination, except that in such case no regents' certificate shall be required, and persons who, before the adoption of these rules, had been admitted as attorneys, but not as counsellors in this state, may be admitted as attorneys and counsellors upon the production of their certificate, and without further examination or delay.

VII.

Any person who has been admitted and has practised three years as an attorney and counsellor in the highest

court of law in another state, may be admitted and licensed without examination. And the General Term of the Supreme Court may, in its discretion, so admit and license any person who has thus practised in another country, or who, being an American citizen and domiciled in a foreign country, has received such diploma or degree therein as would have entitled him, if a citizen of such foreign country, to practise law in its courts. But he must possess the other qualifications required by these rules, and must produce a letter of such other state or country, or furnish their satisfactory evidence of character and qualifications.

VIII.

The time of clerkship shall be computed by the calendar year, and if the period of clerkship shall expire during the term at which the application is made, the applicant may be admitted on any day during the term. The same period of time shall not be duplicated for different purposes, except that a student, attending a law school as herein provided, and who, during the vacations of such school, not exceeding three months in any one year, shall pursue his studies in the office of a practising attorney, shall be allowed to count the time so occupied during such vacation or vacations as part of the clerkship in a law office required by these rules. The judges of the Supreme Court may adopt regulations for conducting the examinations.

These rules of the New York courts apply only to students who intend to practise at the New York bar. It is proper to add that in New Jersey, according to the practice of the courts, eighteen months of time spent in this school is regarded as an equivalent for a like period of clerkship passed in a lawyer's office.

CALENDAR.

- 1887.—Oct 1.—Examination for admission, Saturday.
Oct. 3.—Scholastic year begins, Monday.
Nov. 8.—Election day, holiday.
Nov. .—Thanksgiving day, Thursday, holiday.
Dec. 24.—Winter recess begins.
- 1888.—Jan. 3.—Lectures commence, Tuesday.
Feb. 22.—Washington's birthday, holiday.
March 30.—Good Friday, holiday.
April 27.—Examinations for prizes, Friday.
May 14.—Lectures close, Monday.
May 16.—Examinations for degrees begin, Wednesday.
June 1.—Summer vacation begins.

COLUMBIA COLLEGE

SCHOOL OF POLITICAL SCIENCE

GENERAL STATEMENT.

PURPOSES OF THE SCHOOL.

The School of Political Science was opened on Monday the fourth day of October, 1880.

The purpose of the school is to give a complete general view of all the subjects, both of internal and external public polity, from the threefold standpoint of history, law, and philosophy. Its prime aim is therefore the development of all the branches of the political sciences. Its secondary and practical objects are:

a. To fit young men for all the political branches of the public service.

b. To give an adequate economic and legal training to those who intend to make journalism their profession.

c. To supplement, by courses in public law and comparative jurisprudence, the instruction in private municipal law offered by the School of Law.

d. To educate teachers of political science.

To these ends the school offers a course of study of sufficient duration to enable the student not only to attend the lectures and recitations with the professors, but also to consult the most approved treatises upon the political sciences and to study the sources of the same.

ADMISSION.

Any person may attend any or all of the courses of the School of Political Science by entering his name with the registrar and paying the proper fee.

Students proposing to enter the school are desired to present themselves for matriculation on the Friday next before the first Monday in October.

The names of students intending to become members of the school may be entered at the room of the president on the Monday immediately preceding commencement day in June, or on the day appointed as above for matriculation.

MATRICULATION AND TUITION FEES.

Matriculation fee.—A fee of five dollars is required for matriculation at the beginning of each scholastic year.

Tuition fee.—The annual tuition fee of each student of the school taking the full course is one hundred and fifty dollars, payable in two equal instalments of seventy-five dollars each, the first at matriculation, and the second on the first Monday of February of each year. For single courses of lectures the fee regulates itself according to the number of lectures per week; during the first year the annual fee for a one-hour course being ten dollars; for a two-hour course, twenty dollars; for a three-hour course, thirty dollars; for a four-hour course, forty dollars; and during the second and third years, the annual fee for a two-hour course, thirty; for a three-hour course, forty-five; for a five-hour course, seventy-five; for a six-hour course, ninety dollars. In every case the fee covers the specified number of hours throughout the year—no student being received for a less period than one year. Such fees, when less than one hundred dollars, are payable in advance; otherwise, in half-yearly instalments at the same time as regular fees.

COURSE OF INSTRUCTION: GENERAL SCHEME.

UNDERGRADUATE COURSES.

	Hours per week per half year.
Outline of German History	2
Outline of French History	2
Outline of English History	2
Elements of Political Economy	2

FIRST YEAR.

FIRST SESSION.

Physical and political geography	}	4
Ethnography		
General political and constitutional history of Europe	}	2
Political and constitutional history of England, to 1688		
Political economy: historical and practical		4
Seminarium in political economy		1
History of political theories from Plato to Hegel		3
Bibliography of the political sciences		1

SECOND SESSION.

Hours per week
per half year.

Political and constitutional history of the United States	4
Political and constitutional history of England since 1688	2
Political economy: taxation and finance	4
Seminarium in political economy	1
History of political theories from Plato to Hegel	3
Political history of the State of New York	2
Bibliography of the political sciences	1

SECOND YEAR.

FIRST SESSION.

History of Roman law, to the present day	} 6
Comparative jurisprudence, general part	
Comparative constitutional law of the principal European states and of the United States	3
History of economic theories	2
Railroad problems	3
Seminarium in political economy	1

SECOND SESSION.

Comparative jurisprudence	6
Comparative constitutional law of the several commonwealths of the American Union	3
History of economic theories	2
Financial and tariff history of the United States	3
Seminarium in political economy	1

THIRD YEAR.

FIRST SESSION.

General history of diplomacy	2
Latin-American diplomacy	2
International private law	1
Comparative administrative law of the principal states of Europe and of the United States	5
Social science: statistics, methods, and results	2

SECOND SESSION.

Public international law	2
Latin-American diplomacy	2
International private law	1
Comparative administrative law of the principal states of Europe and of the United States	5
Social science: communistic and socialistic theories	2

COURSE OF INSTRUCTION IN DETAIL.

I.—CONSTITUTIONAL HISTORY.

The student is supposed to be familiar with the outlines of European history, ancient and modern. Students who are not thus prepared are recommended to take the undergraduate courses in English, French, and German history. The courses of lectures held in the school are as follows :

1. *General political and constitutional history*, comprehending in detail : a view of the political civilization of imperial Rome ; the history of the development of the government of the Christian church into the form of papal monarchy ; the overthrow of the Roman imperial system and the establishment of German kingdoms throughout middle, western, and southern Europe ; the character and constitution of these kingdoms ; the conversion of the Germans to the Christian church, and the relations which the Christian church assumed towards the Germanic states ; consolidation of the German kingdoms into the European empire of Charlemagne ; character and constitution of the Carolingian state ; its disruption through the development of the feudal system and the independent hierarchic church, and division into the kingdoms of Germany, France, and Italy ; character and history of the feudal system as a state form ; reestablishment of the imperial authority by the re-connection of Germany with Italy ; conflict of the middle ages between church and state ; the political disorganization and papal despotism resulting from the same ; the development of the absolute monarchy and the reformation ; the limitation of absolute kingly power and the development of constitutionalism—first in England, then in the United States, thirdly in France, and fourthly in Germany ; lastly, the realization of the constitutional idea of the nineteenth century.

2. *Political and constitutional history of England*.—This course supplements the general course above outlined, giving a fuller view of the constitutional development of England from the Anglo-Saxon period to the present day.

3. *Political and constitutional history of the United States*.—This course of lectures covers the history of the colonies and of the revolutionary war ; the formation and dissolution of the confederate constitution ; the formation of the constitution of 1787, and its application down to the civil war ; the changes wrought in the constitution by the civil

war, and the resulting transformation of the public law of the United States.

4. *The political and constitutional history of Rome* is contained in the general history of Roman law. The topics to which especial attention is paid are: The probable origin of the city and its relation to the Latin confederacy; the character and mutual relation of the *gentes* and the kingship; the Servian constitution and the aristocratic reaction; the establishment of the aristocratic republic; the struggle between the orders and the modification of the constitution; the conquest of Italy and the relations established between Rome and the conquered states; the increase of the powers of the Roman senate; the conquest of the Mediterranean basin and the organization and government of the provinces; the social and economic effects of the conquest upon the Roman people; the struggle between the senatorial clique and the party of reform; the social and civil wars and the establishment of the principate; the development, in the third century after Christ, of the absolute empire; the alliance of the empire with the Christian church; the conquest of Italy by the Germans.

5. *Political history of the State of New York*.—The purpose of this course is to give a knowledge of the constitutional development and political history of the State of New York, beginning with the foundation of the colony by the Dutch and extending to the present time. It gives a brief account of the condition of the colony of New York, and the constitution of its government; then of the constitution made in 1777, and of each of the constitutions of 1821 and 1846, the amendments of 1875, together with the conventions in which each of these constitutions was made; also the history of political parties in the State of New York, showing their particular relation to these constitutions, and showing finally the methods of procedure of those parties and the influence exercised by them upon the legislation and procedure, or "practical politics" of other States and of the great national political parties.

II.—CONSTITUTIONAL AND ADMINISTRATIVE LAW.

1. *Comparative constitutional law of the principal European states and of the United States*; comprehending a comparison of the provisions of the constitutions of England, United States, France, and Germany, the interpretation of the same by the legislative enactments and judicial deci-

sions of these states, and the generalization from them of the fundamental principles of public law, common to them all.

2. *Comparative constitutional law of the several commonwealths of the American Union.*—In this course of lectures comparison is made in the same manner of the constitutions of the thirty-eight States of the Union.

3. *Comparative administrative law of the principal European states and of the United States.* The purpose of this course of lectures is to give a description of the methods of administration in the United States, France, Germany, and England. Special attention will be given to the laws both of Congress and of the different state legislatures, while the laws of foreign countries will be referred to for the purpose of instruction and comparison. The following list of topics will give a general idea of the subject, for which the name of administrative law has been chosen, because both in France and Germany, where this special part of the public law has been selected as the object of a thorough course of instruction, a similar name has been made use of.

a. Organization.

BOOK I. *Central government.* The different officers of the government and executive councils; their tenure of office, their relations one to another, their powers and duties; the civil service, and the movement for reform in this part of our administration. BOOK II. *Local government.* This subject will be treated in the same way: the method of election, the tenure of office, and the powers and duties of the officers of the counties, towns, and cities, and of the corresponding divisions in foreign states; local (including municipal) taxation and finance.

b. Subjects of administrative action.

This part of the lectures will treat of the relations of the administrative authorities, both general and local, with the citizens.—BOOK I. *Financial administration.* The management of public property, taxation, and public accounts, considered from the administrative rather than from the financial standpoint.—BOOK II. *Internal administration.* The legal provisions which aim at the prevention of evil, and which are sometimes designated as police measures—measures tending to prevent public disorder, public immorality, and disease. Further, provisions of a more positive character, whose purpose is to promote the public wel-

fare ; thus measures taken to provide means of public communication ; to further the interests of trade, commerce, and industry ; to ensure the control of the state over enterprises of a quasi-public character, such as railway companies and institutions of credit ; to assist the poor, and educate the ignorant.

c. Control.

The last part of the course will be devoted to the control exercised over the administration and to the remedies guaranteed by law to the individual against arbitrary and unwarrantable administrative action. It will be found that this control is threefold in its character. I. *Administrative control*. This is exercised by the superior over the inferior administrative officers by means of the power of removal and the power (given in many cases) to annul or amend administrative acts.—II. *Judicial control*. This is exercised by the courts, to which recourse is often granted against the action of the administration. Here the new courts will be examined, which have been established in France and Germany during this century, and to which the name of administrative courts has been given. III.—*Legislative control*. This is exercised by the legislature by means of its power to inform itself of the acts of the administration, and, if need be, to impeach administrative officers.

Each topic which will come under consideration will be treated historically, and with reference to the positive, existing law ; and for matters of special interest the comparison of systems of legislation will be extended to other countries than the four mentioned, when it is thought that this may be done with profit. In general, however, the comparison will be limited to the United States, France, Germany, and England.

4. *Municipal administration*.—The subjects to which special attention will be directed in these lectures are : the growth and importance of cities ; the independence of cities from state control ; the city as a public organ, and as a juristic person—a corporation ; city organization and municipal elections ; municipal civil service ; city property and local taxation ; police power in cities, and measures to regulate drinking saloons and prevent disorders. In these lectures special attention is given to American cities and the city of New York ; but the experience of foreign cities will be appealed to whenever it is thought that any thing may be learned therefrom.

III.—POLITICAL ECONOMY AND SOCIAL SCIENCE.

It is presumed that students possess a knowledge of the general principles of political economy as laid down in the ordinary manuals by Rogers, Fawcett, and Mill, before entering the school. Students who are not thus prepared are recommended to take the undergraduate course on the elements of political economy.

The courses of lectures held in the school are as follows:

1. *Historical and practical political economy*.—This course is intended to give the student a knowledge of the economic development of the world, in order that he may understand present economic institutions and solve present economic problems. The principal topics are: Introduction, concerning the study of political economy and its relation to political science; general sketch of the economic development of the world; the institutions of private property, bequest and inheritance, and the principle of personal liberty as affecting the economic condition of the world; the problems of production, such as land tenure, population, capital, different forms of productive enterprise, statistics of production, particularly the natural resources of the United States; problems of exchange, such as free trade and protection, railroads, money, bimetallism, paper-money, banking, commercial crises, etc.; problems of distribution, such as wages, trades-unions, co-operation, poor-relief, factory laws, profit and interest, rent, progress and poverty; and finally a consideration of the function of the state in economic affairs.

2. *Science of finance*.—This course is also historical as well as comparative and critical. It treats of the expenditure of the state and the methods of meeting the same among different civilized nations. It describes the different kinds of state revenue, especially taxes, and discusses the principles of taxation. It considers also public debt, methods of borrowing money, redemption, refunding, repudiation, etc. Finally it describes the financial organization of the state, by which the revenue is collected and expended. Students are furnished with the current public documents of the United States treasury, and expected to understand all the facts in regard to public debt, banking, and coinage therein contained.

3. *Financial and tariff history of the United States*.—This course endeavors to present a complete survey of American legislation on currency, finance, and taxation, including the

tariff legislation, from the beginning to the present day. Attention is called in especial to the financial history of the colonies and the confederation; to the genesis, development, and influence of the protective tariffs; to the banking and currency problems up to the secession; to the financial legislation of the war; and finally to the recent development both state and national.

4. *History of economic theories.*—This course comprises two parts. In the first the various systems are discussed, attention being directed to the connection between the theories and the organization of industrial society. In the second, the separate doctrines—*e. g.*, of capital, rent, wages, etc.—are treated in their historical development. The first part is subdivided as follows:

- I. *Antiquity*: Orient, Greece, and Rome.
- II. *Middle Ages*: Aquinas, Glossators, writers on money, etc.
- III. *Mercantilists*: Stafford, Mun, Petty, North, Locke; Bodin, Vauban, Forbonnais; Serra, Galiani, Justi, etc.
- IV. *Physiocrats*: Quesnay, Gournay, Turgot, etc.
- V. *Adam Smith and Precursors*: Tucker, Hume, Cantillon, Stewart.
- VI. *English School*: Malthus, Ricardo, Senior, McCulloch, Chalmers, Jones, Mill, etc.
- VII. *The Continent*: Say, Sismondi, Hermann, List, Bastiat, etc.
- VIII. *German School*: Roscher, Knies, Hildebrand.
- IX. *Recent Development*: Rogers, Jevons, Cairnes, Bagehot, Leslie, Toynbee; Wagner, Schmoller, Held, Brentano; Cherbuliez, Leroy-Beaulieu, De Lavéleye; Cossa, Nazzari, Loria; Carey, George, Walker.

5. *Communitistic and socialistic theories.*—The present organization of society is attacked by socialistic writers, who demand many changes, especially in the institution of private property and the system of free competition. It is the object of this course to describe what these attacks are, what changes are proposed, and how far these changes seem desirable or possible. At the same time an account is given of actual socialistic movements, such as the international, social democracy, etc. Advantage is taken of these discussions to make the course really one on social science, by describing modern social institutions, such as private property, in their historical origin and development, and their present justification.

6. *Statistical science ; methods and results.*—This course is intended to furnish a basis for a social science by supplementing the historical, legal, and economic knowledge already gained by such a knowledge of social phenomena as can be gained only by statistical observation. Under the head of statistics of population are considered: race and ethnological distinctions, nationality, density, city, and country, sex, age, occupation, religion, education, births, deaths, marriages, mortality tables, emigration, etc. Under economic statistics: land, production of food, raw material, labor, wages, capital, means of transportation, shipping, prices, etc. Under the head of moral statistics are considered: statistics of suicide, vice, crime of all kinds, causes of crime, condition of criminals, repression of crime, penalties and effect of penalties, etc. Finally is considered the method of statistical observations, the value of the results obtained, the doctrine of free will, and the possibility of discovering social laws.

7. *Railroad problems, economic, social, and legal.*—These lectures treat of railroads in the fourfold aspect of their relation to the investors, the employees, the public, and the state, respectively. A history of railways and railway policy in America and Europe forms the preliminary part of the course. All the problems of railway management, in so far as they are of economic importance, come up for discussion. Among the subjects treated are: financial methods, railway construction, speculation, profits, failures, accounts and reports, expenses, tariffs, principles of rates, classification and discrimination, competition and pooling, accidents, employers' liability, etc. Especial attention is paid to the methods of regulation and legislation in the United States as compared with European methods, and the course closes with a general discussion of state *versus* private management.

8. *Seminarium in political economy.*—Outside of the regular instruction in political economy and social science, it is the intention to furnish the students of the school an opportunity for special investigation of economic and social questions under the direction of the professor. This is done by means of original papers prepared by such students as choose to engage in this work. The papers are read before the professor and the students, and are then criticised and discussed. The number of meetings and the topics to be discussed are determined each year. During the coming year it is proposed to investigate various aspects of the labor problem.

IV.—ROMAN LAW AND COMPARATIVE JURISPRUDENCE.

The Roman law has passed through three wholly distinct stages of development :

I. It was primarily the law developed by a single people, the national system of the Romans.

II. This people brought the entire world under its sway. The national Roman law was inadequate for the Roman empire, and a new and different Roman law was evolved—a universal system.

III. Nearly a thousand years after the overthrow of the West-Roman empire, the Roman law became again a universal law. The Justinian codes became statute law for a part of Europe only ; but the juristic system of the Roman law became, and is still, the basis of European jurisprudence. But the modern world has given to the Roman juristic theories a further development, and has thus produced a third and substantially new system—modern Roman law.

The lectures on the history of the Roman law trace its development through all its stages. The subsequent lectures of the second year are devoted to the presentation of the third system—modern Roman law.

1. *History of European Law.*

BOOK I. *Primitive law.* The following topics are discussed from the comparative standpoint : evolution of the primitive state ; the religious sanction of primitive law ; redress of wrongs in primitive society, and the evolution of criminal and civil jurisdiction and procedure ; early family and property law.—BOOK II. *Roman law : national system.* (Royal and republican period.) The struggle between the orders and the development of a common law (XII. Tables). The leading principles and juristic technique of the national system (*jus civile*).—BOOK III. *Roman law : development of the universal system.* (Later republican period.) The conquest of the entire civilized world, and the social, economic, and legal changes produced by the conquest. Reform of criminal law and procedure. The development of a universal commercial law by means of the prætorian edicts. The prætorian formulæ of action.—BOOK IV. *Roman law : universal system.* (Early imperial period.) The empire under republican forms. Development of criminal and civil procedure *extra ordinem*. The classical jurisprudence.—BOOK V. *Roman law : universal system.* (Later imperial period.)

Social, economic, and legal decadence. Codification of the law by Justinian.—BOOK VI. *German law*. Character of early German law; the reforms of Charles the Great; maintenance of Carolingian institutions in Normandy, and further development of these institutions in Norman England; general disappearance of the Carolingian institutions on the continent, and arrest of the legal development.—BOOK VII. *The Roman law in the mediæval and modern world*. The conquest of the Roman empire by the Germans. Imperfect survival of the Roman law: (1) in the Byzantine empire; (2) in the new German kingdoms, as personal law of the conquered Romans; (3) in the Christian church. Establishment and extent of the ecclesiastical jurisdiction; the development and the codification of the canon law; influence exercised by this law upon the subsequent development of Europe.—*Renaissance and reception of the Justinian law* (1100–1500). Revival of the study of the Justinian law in Italy; influx of foreign students. The theory of imperium continuum. Reception of the Justinian law in the German empire; partial reception in France and Spain; failure of the Roman law to gain footing in England. Influence of the Roman law in other countries: the “scientific” as distinguished from the “practical” reception.—*The reaction against the Roman law*: (1) among the people; (2) among the jurists; (3) in modern legislation. The great national codes of the 18th and 19th centuries. Relation of these codes to the Roman law.

2. *Modern Roman law, or comparative jurisprudence of the principal European systems of private law*.—Modern Roman law is not a system of positive law, but a system of juristic theory. Its basis is the classical jurisprudence of imperial Rome; its further development has been attained by the labors of modern jurists and by modern legislation.

It is attempted to present succinctly the leading principles of this system, noticing the more important modern legislations in so far as they have introduced new juristic conceptions. The principal points of divergence between Roman legal conceptions and those of German origin are also noticed.

The order of treatment is as follows: A. General part. (1) Law in general. (2) Legal relations in general. B. Special part. (1) Things. (2) Obligations. (3) Family. (4) Inheritance.

3. *Seminarium for studies in comparative legislation*.—The second-year courses above described lay the basis for

the comprehension of foreign legislations. The object of the seminarium, in the third year, is to train the student in the practical use of these legislations. Participation in the seminarium is optional. The work is to be done by the students themselves, under the direction and with the assistance of the professor in this department. It is intended that they shall devote themselves to the study of questions of practical interest *de lege ferenda*, and that they shall collate and compare the solutions given to these questions in our own and in foreign countries.

4. *International private law.*

In this course the theories of the foreign authorities are noticed, and the practice of the foreign courts in the so-called conflicts of private law is compared with the solution given to these questions by our own courts.

V.—DIPLOMACY AND INTERNATIONAL LAW.

1. *The history of diplomacy from the peace of Westphalia to the treaty of Berlin.*—The object of this course is to present, in their historical connection, the international treaties and conventions framed between these two periods, and to trace through them the development of the principles of international law.

2. *Latin American diplomacy.*—The object of this course is to give a knowledge of the leading questions of international law that have arisen in Latin America, of their historical development, and of the attitude taken in reference to these questions by the government of the United States. The course embraces:

I. The history of the diplomacy of Spain and Portugal with respect to America, during the colonial period; and the history of the diplomatic relations between the empire of Brazil and its republican neighbors, down to our own time. The course closes with the new relations established between these states after the war against Paraguay, 1865-70.

II. European interventions in Latin America.

- a. The forcible occupation by Great Britain of the Malvinas (Falkland Islands), 1833.
- b. The French intervention in La Plata, 1838-40.
- c. The French intervention in Mexico, 1838.
- d. The British intervention in Central America.
- e. The joint intervention of France and England in La Plata, 1845-50.

- f.* The Spanish intervention in St. Domingo, 1861.
- g.* The joint intervention of England, France, and Spain in Mexico, 1861.
- h.* The Spanish intervention in the South Pacific, 1864.
- 3. *International law*.—In this course the principles attained through usage, treaty, and convention are arranged in systematic form.

VI.—POLITICAL PHILOSOPHY.

The course of lectures on the *history of political theories* which is given during the first year will include :

- 1. The theories of the Greeks as represented by Plato and by Aristotle.
- 2. The idea of the Christian church is represented :
 - a.* In the patristic age by St. Augustine.
 - b.* In the scholastic age by St. Thomas Aquinas.
- 3. The political theories of the renaissance as represented by Dante and Machiavelli.
- 4. Modern theories of the state in England, France, and Germany.

VII.—BIBLIOGRAPHY OF HISTORY AND POLITICAL SCIENCE.

The purpose of this course of lectures is to give for the practical use of students and investigators an account of the original sources for the study of history and political science. It gives, in introduction, a brief encyclopedic statement of the domain of political science and the several allied sciences or branches of study, with their mutual interrelations. It then takes up, by countries, the material which forms the record of the political, legal, and economic activity of the leading modern states, giving a short sketch of the historiography of each country ; the special bibliographical works relating to the subject ; then a description of all important collections of early chronicles and histories ; collections of memoirs ; collections and publications of historical and similar societies ; general and special collections of treaties and diplomatic papers ; statistical collections and other economic publications ; government and official publications, including public documents, parliamentary debates, statutes, law reports, and other collective works in the field of public and private law.

It is intended to give the title, proper form of citation, history, and character of these publications, and the way in

which they are indexed and may be used. An account of the archives and public records of each state treated is also given, with a description of their calendars or indexes, printed and unprinted, their general character, arrangement, and regulations for use.

PRIZES.

PRIZE FELLOWSHIPS.

In 1886 Mr. Jesse Seligman founded four fellowships of the annual value of two hundred and fifty dollars each. These fellowships are awarded at the discretion of the faculty to students of the third year in the School of Political Science, under the sole condition that the recipient of the fellowship be a candidate for the degree of doctor of philosophy.

PRIZE IN POLITICAL ECONOMY.

An annual prize of one hundred and fifty dollars for the best essay on some subject in political economy has been established by Mr. Edwin R. A. Seligman of the class of 1879. Competition for the prize is open to all members of the School of Political Science. The topic selected must be approved by the faculty, and the essay itself must not be less than twenty-five thousand words in length.

PREPARATION FOR THE CIVIL SERVICE.

Young men who wish to obtain positions in the United States Civil Service—especially in those positions in the Department of State for which special examinations are held—will find it advantageous to follow many of the courses in the School of Political Science. Some of the subjects upon which applicants for these positions are examined are treated very fully in the curriculum of the school. Thus, extended courses of lectures are given on political geography and history, diplomatic history and international law, government and administration.

Full opportunity is given in the School of Arts for the study of the principal modern languages, and all the courses in that school are open to the students of the School of Political Science.

ADMISSION TO OTHER COURSES.

ADMISSION TO UNDERGRADUATE COURSES.

Any student of the School of Political Science may attend any or all of the courses of the School of Arts, with the permission of the instructors concerned, without the payment of any further tuition fee than that due to the School of Political Science.

ADMISSION TO GRADUATE COURSES.

The trustees have provided that courses of instruction shall be given in the college to graduates of this and other colleges in a large variety of subjects. Students of the School of Political Science, who may be bachelors of arts, of letters, or of science at entrance, or who, after having completed their first year in the School of Political Science, shall have received their first degree, may be admitted without additional tuition fee to the graduate classes, in such subjects as they may desire to pursue, and which will not interfere with their regular studies in the school. A list of the subjects embraced in the scheme of graduate instruction for the ensuing year will be furnished on application to the registrar of Columbia College, Madison avenue and 49th street, New York City.

ADMISSION TO THE COURSES OF THE SCHOOL OF LAW.

Those students who intend to make law their profession, may combine the ordinary course of study required for admission to the bar with the course in political science. The hours of lectures in the two schools are so arranged as to make this combination feasible; and experience has shown that the satisfactory completion of both courses within three years is not beyond the powers of an industrious student of fair ability.

The instruction offered in the School of Political Science

upon constitutional, administrative, and international law, and upon Roman law and comparative jurisprudence, furnishes the natural and necessary complement to the studies of the School of Law. Law is, with us, the chief avenue into politics; and for this, if for no other reason, a complete legal education should include the science of politics. But the importance to the lawyer of the subjects above mentioned does not depend simply on the prospect of a political career. To become a thorough practitioner the student must acquire a thorough knowledge of public law; and if he wishes to be any thing more than an expert practitioner, if he wishes to know law as a science, some knowledge of other systems than our own becomes imperative. From this point of view the Roman law is of paramount importance, not merely by reason of its scientific structure, but because it is the basis of all modern systems except the English. Elsewhere than in our own country these facts are uniformly recognized, not in the schemes of legal instruction only, but in the state examinations for admission to the bar.

In order to encourage, by the combination of the two courses, the acquisition of a well-rounded juristic training, the trustees have provided that any student of the School of Political Science may attend any or all of the courses of the School of Law, without the payment of any further tuition fee than that due to the School of Political Science; and, conversely, that any student of the School of Law may attend any or all of the lectures in the School of Political Science, without payment of any further tuition fee than that due to the School of Law; and that the student matriculated in both schools may be a candidate for degrees in both schools at the same time.

LIBRARY.

Until the year 1883, each school of Columbia College had its special library. The libraries of the college proper (School of Arts) and of the Law School of course contained many works on history and political science. The special library of political science, the collection of which began in 1877, was intended to supplement those libraries by the addition of the most recent and most valuable European

and American works in this department. Particular attention was, and is, given to providing the material needed for original investigation. In 1883 this special library contained more than 3,000 volumes.

Upon the completion of the new library building in the autumn of 1883, the special libraries of Columbia College were consolidated into one university collection. The total number of volumes in the department of history and political science is at present (1886) more than 14,000. In the department of law the total number of volumes is about 8,000. The original material requisite for the study of foreign law has been largely increased during the last two years.

The students of the School of Political Science are entitled to the use, subject to the rules established by the library committee, of the entire university library. Free access is permitted to more than 25,000 volumes on the walls of the main hall, which is employed as a reading-room. Smaller and more private reading-rooms are reserved for students engaged in special lines of work. The library is open from 8 A.M. to 10 P.M. Information concerning the sources and literature of the political sciences is given in the various courses of lectures held in the schools. The students can obtain supplementary information and general guidance and assistance in their investigations, from the librarian in special charge of law, history, and political science.

EXAMINATIONS AND DEGREES.

No student of the school can be a candidate for any degree unless he have successfully pursued a course of undergraduate study in this college, or in some other maintaining an equivalent curriculum, to the close of the junior year.

Students thus qualified, who shall satisfactorily complete the studies of the first year, shall be entitled, on examination and recommendation of the faculty, to receive the degree of bachelor of philosophy or the degree of bachelor of art. The latter degree requires the concurrence of the Faculty of Arts, and is not conferred unless the student has taken courses, in the first year of the School of Political Science, or courses in that year and in the senior year of the School of Arts, amounting to fifteen hours per week.

Students of the school who have obtained the degree of bachelor of arts at this college, or at some other maintaining an equivalent curriculum, and who shall satisfactorily complete the studies of the second year, shall be entitled, on examination and recommendation of the faculty to the degree of master of arts.

The examination of candidates for the degree of bachelor of philosophy, bachelor of arts, and master of arts will begin on Monday of the third week preceding commencement.

Students who shall have successfully completed the studies of the entire course of three years, and shall have been similarly recommended, will receive the degree of doctor of philosophy.

To obtain recommendation for the last degree, the candidate will be required :

1. To prepare an original dissertation not less than 20,000 words in length, upon a subject approved by the faculty.
2. To defend such dissertation before the faculty.
3. To pass an oral examination upon all the studies of the three years.
4. To pass collateral examinations (reading at sight) upon Latin, and either French or German.

The candidate for the degree of doctor of philosophy may present himself for examination at any time when the college is in session, excepting in the month of June. The subject chosen by the candidate for his dissertation should be made known to the faculty at least four months before the proposed time of examination thereupon. A printed (or type-written) copy of the dissertation must be submitted to each member of the faculty at least one month before the day of examination. The title-page must contain the name of the candidate and the words "Submitted as one of the requirements for the degree of doctor of philosophy in the School of Political Science, Columbia College."

The successful candidate must present a copy of his dissertation to the college library.

All degrees awarded will be publicly conferred at commencement.

EXAMINATION FEES.

Examination fees are as follows: For the degree of bachelor of arts, fifteen dollars; for the degree of bachelor of philosophy, twenty-five dollars; for the degree of master of arts, twenty-five dollars; for the degree of doctor of philosophy, thirty-five dollars. The examination fee must in each case be paid before the candidate presents himself for examination for the degree.

COMMENCEMENT.

The commencement exercises of the college take place annually on the second Wednesday of June.

ACADEMY OF POLITICAL SCIENCE.

This institution is devoted to the cultivation and advancement of the political sciences. It is composed mainly of graduates of the Schools of Law and Political Science of Columbia College, but any person whose previous studies have fitted him to participate in the work of the Academy is eligible to membership.

Meetings of the Academy are held on the first and third Mondays of each month. At these meetings papers are read by members presenting the results of original investigation by the writers in some department of political science.

PRIZE LECTURESHIPS.

The trustees have established in the School of Political Science three prize lectureships of the annual value of five hundred dollars each, tenable for three years. The power of appointment is vested in the faculty. One of these three lectureships becomes vacant at the close of each academic year. The previous holder may be reappointed. The conditions of competition are as follows:

1. The candidate must be a graduate of the School of Political Science or of the Law School of Columbia College. In the latter case he must have pursued the curriculum of the School of Political Science for at least two years.

2. He must be an active member of the Academy of Political Science.

3. He must have read at least one paper before the Academy of Political Science during the year next preceding the appointment.

The duty of the lecturer is to deliver annually, before the students of the School of Political Science, a series of at least twenty lectures, the result of original investigation.

FIRST YEAR.

FIRST SESSION.

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
1.30-2.30	General Constitutional History of Europe, Prof. BURGESS.	General Constitutional History of Europe, Prof. BURGESS.	General Constitutional History of Europe, Prof. BURGESS.	General Constitutional History of Europe, Prof. BURGESS.	Political Economy, Prof. R. M. SMITH. 2-3
2.30-3.30	Political Economy, Prof. R. M. SMITH.	Political Economy, Prof. R. M. SMITH.	Bibliography, Mr. BAKER.	Political Economy, Prof. R. M. SMITH.	History of Political Theories, Prof. ALEXANDER. 3-4
3.30-4.30	History of Political Theories, Prof. ALEXANDER.	Constitutional History of England, Prof. R. M. SMITH.	History of Political Theories, Prof. ALEXANDER.	Constitutional History of England, Prof. R. M. SMITH.	Political History of New York, Mr. WHITRIDGE. 4-5

SECOND SESSION.

1.30-2.30	Constitutional History of the United States, Prof. BURGESS.	Constitutional History of the United States, Prof. BURGESS.	Constitutional History of the United States, Prof. BURGESS.	Constitutional History of the United States, Prof. BURGESS.	Political Economy, Prof. R. M. SMITH. 2-3
2.30-3.30	Political Economy, Prof. R. M. SMITH.	Political Economy, Prof. R. M. SMITH.	Bibliography, Mr. BAKER.	Political Economy, Prof. R. M. SMITH.	History of Political Theories, Prof. ALEXANDER. 3-4
3.30-4.30	History of Political Theories, Prof. ALEXANDER.	Constitutional History of England, Prof. R. M. SMITH.	History of Political Theories, Prof. ALEXANDER.	Constitutional History of England, Prof. R. M. SMITH.	Political History of New York, Mr. WHITRIDGE. 4-5

SECOND YEAR.
FIRST SESSION.

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
1.20-2.20	History of Roman Law, Prof. MUNROE SMITH.	History of Roman Law, Prof. MUNROE SMITH.	History of Roman Law, Prof. MUNROE SMITH.	History of Roman Law, Prof. MUNROE SMITH.	
2.20-3.20	History of Roman Law, Prof. MUNROE SMITH.	Comparative Constitutional Law, Prof. BURGESS.	Comparative Constitutional Law, Prof. BURGESS.	Comparative Constitutional Law, Prof. BURGESS.	History of Roman Law, Prof. MUNROE SMITH. 2-3
3.30-4.30	Railroad Problems, Dr. SELIGMAN.	History of Economic Theories, Dr. SELIGMAN.	Railroad Problems, Dr. SELIGMAN.	History of Economic Theories, Dr. SELIGMAN.	Social Science, Prof. R. M. SMITH. 3-4
					Seminarium, Prof. R. M. SMITH. 4-5

SECOND SESSION.

1.20-2.20	Comparative Jurisprudence, Dr. MUNROE SMITH.	Comparative Jurisprudence, Dr. MUNROE SMITH.	Comparative Jurisprudence, Dr. MUNROE SMITH.	Comparative Jurisprudence, Dr. MUNROE SMITH.	
2.20-3.20	Comparative Jurisprudence, Dr. MUNROE SMITH.	Comparative Constitutional Law, Prof. BURGESS.	Comparative Constitutional Law, Prof. BURGESS.	Comparative Constitutional Law, Prof. BURGESS.	Comparative Jurisprudence, Dr. MUNROE SMITH. 2-3
3.30-4.30	Financial and Tariff History of U. S., Dr. SELIGMAN.	History of Economic Theories, Dr. SELIGMAN.	Financial and Tariff History of U. S., Dr. SELIGMAN.	History of Economic Theories, Dr. SELIGMAN.	Social Science, Prof. R. M. SMITH. 3-4
					Seminarium, Prof. R. M. SMITH.

THIRD YEAR.

FIRST SESSION.

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
2.30-3.30	History of Diplomacy, Prof. BURGESS.	Latin-American Diplomacy, Dr. DE LEON.	Administrative Law, Mr. GOODNOW.	International Private Law, Prof. MUNROE SMITH.	History of Diplomacy, Prof. BURGESS. 2-3
3.30-4.30	Administrative Law, Mr. GOODNOW.	Administrative Law, Mr. GOODNOW.	Administrative Law, Mr. GOODNOW.	Administrative Law, Mr. GOODNOW.	Social Science, Prof. R. M. SMITH. 3-4
4-5					Seminarium, Prof. R. M. SMITH.

SECOND SESSION.

2.30-3.30	Public International Law, Prof. BURGESS.	Latin-American Diplomacy, Dr. DE LEON.	Administrative Law, Mr. GOODNOW.	Latin-American Diplomacy, Dr. DE LEON.	Public International Law, Prof. BURGESS. 2-3
3.30-4.30	Administrative Law, Mr. GOODNOW.	Administrative Law, Mr. GOODNOW.	Administrative Law, Mr. GOODNOW.	Administrative Law, Mr. GOODNOW.	Social Science, Prof. R. M. SMITH. 3-4
4.30-5.30					Seminarium, Prof. R. M. SMITH. 4-5

CALENDAR.

- 1887—Oct. 1.—Matriculation, Saturday.
Oct. 3.—Lectures begin, Monday.
Nov. 8.—Election day, holiday.
Nov. —Thanksgiving day, holiday.
Dec. 26.—Christmas recess begins, Monday.
- 1888—Jan. 7.—Christmas recess ends, Saturday.
Feb. 8.—First session ends, Wednesday.
Feb. 9.—Second session begins, Thursday.
Feb. 15.—Ash Wednesday, holiday.
Feb. 22.—Washington's birthday, holiday.
Mar. 30.—Good Friday, holiday.
Apr. 2.—Easter Monday, holiday.
May 21.—Examinations begin, Monday.
June 13.—Commencement, Wednesday.

COLUMBIA COLLEGE

COLLEGIATE COURSE FOR WOMEN

GENERAL STATEMENT.

ESTABLISHMENT OF THE COURSE.

By a resolution of the trustees of Columbia College, adopted June 8, 1883, it was ordered that a course of collegiate study, equivalent to the course given to young men in the college, should be offered to such women as may desire to avail themselves of it, to be pursued under the general direction of the faculty of the college, in accordance with the following principles and regulations :

1. That such course of study shall extend over a term of four years.

2. That it shall be arranged in groups.

3. That of these groups, one shall be required for the first two years, and that with it another shall be selected.

4. That on the expiration of the first two years, all the groups shall become elective.

5. That a general and very strict preliminary examination shall be held for admission to the four years' course, and that this examination shall have reference to the course in general, like the examination for entrance into the freshman class in college.

6. That, unless under special circumstances, no young woman shall be admitted to such entrance examination before she shall have attained the age of seventeen years.

7. That every student so admitted shall be entirely free as to where and how to pursue her studies, whether in some school, private or public, or at home, or under the auspices or direction of any association interested in her welfare and advancement, and providing her with the means of education.

8. That examinations shall be held as often as may be necessary ; such examinations to be conducted by officers of the college, or their duly appointed representatives, and to be in writing.

In accordance with these principles there has been arranged the following

PLAN FOR THE COLLEGIATE EDUCATION OF WOMEN.

1. A course of collegiate study is offered to women arranged under the following

Groups :

- I.—English language and literature.
- II.—Modern languages and foreign literature.
- III.—Latin language and literature.
- IV.—Greek language and literature.
- V.—Mathematics.
- VI.—History and political science.
- VII.—Physics, chemistry, and hygiene.
- VIII.—Natural history, geology, palæontology, botany, and zoölogy.
- IX.—Moral and intellectual philosophy.

2. The course shall extend over four years, to be known simply as the first, second, third, and fourth.

3. No woman shall be admitted to the course before she shall have attained the age of seventeen years, unless in case of extraordinary proficiency, of which the examiners shall be the judges.

4. A preliminary examination for entrance shall be held annually, at such time and place as shall be agreed upon hereafter. The fee for such preliminary examination shall be five dollars.

5. Every person having passed the entrance examination shall pursue for the first and second years the first group, viz., English language and literature, and must, in addition, select at least one more group. At the end of the first year a new selection may be made in place of the group selected at the beginning of that year, and at the end of the second year the entire course is elective.

6. The place and manner of pursuing her studies are left to the discretion of each student.

7. Examinations shall be held as often as may be necessary; they shall be in writing, and conducted by professors or officers of the college, to be appointed by the Board of the College, and at such time and place as may be duly appointed. The fee at each examination shall be five dollars.

ADMISSION.

An examination for admission to the course will be held annually at the college on Monday and the days following of the week preceding commencement week, and on Mon-

day and the days following of the week preceding the first Monday in October.

At the examination all candidates will be examined on the following subjects :

1. *English grammar*.—No particular text-book required.
2. *English composition*.—A composition to be written in the room at the time of examination, on a subject proposed by the examiner, and to be of at least one foolscap page in length.
3. *Ancient geography*.—Schmidt's Course (or equivalent), with Long's Classical Atlas, with particular attention to Italy, Sicily, Greece, and Asia Minor.
4. *Modern geography*.—Appleton's Standard Higher Geography.
5. *Ancient history*.—Rawlinson's Manual, or equivalent.
6. *Arithmetic* (with the metric system of weights and measures).—No particular text-book required.

For admission to courses other than the English the further requirements will be as follows :

I. LATIN LANGUAGE AND LITERATURE.

1. Latin grammar, including the rules of quantity.
2. Latin prose composition.
3. The first four books of Cæsar's Commentaries on the Gallic War.
4. One thousand lines of Ovid (Lincoln's selections), and six books of the Æneid, with scanning of the verse.
5. Six orations of Cicero, including that for the Manilian Law.

II. GREEK LANGUAGE AND LITERATURE.

1. Greek grammar, including prosody.
2. Xenophon's Anabasis (four books).
3. Homer's Iliad (three books).
4. Greek prose composition.

III. MODERN LANGUAGES AND FOREIGN LITERATURE.

For the elementary course no preliminary examination will be required. For an advanced course the requirements will be as follows :

FRENCH.

1. Chardenal's First French Course.
2. O'Connor's Choix de Contes Contemporains.

3. Brachet and Dussouchet's *Petite Grammaire Française*, Part I.
4. Translations from English into French.

GERMAN.

1. Sheldon's *German Grammar*.
2. Stahl's *German Versions*.
3. Twenty-five pages of Whitney's *German Reader*.

ITALIAN.

1. Sauer's *Grammar*.
2. Stoppani's *Il Bel Paese*.

SPANISH.

1. Josse's *Grammar*.
2. One book of *Gil Blas*.
3. Sixty pages of Mantilla's *Libro de Lectura*.

IV. MATHEMATICS.

1. *Algebra*: the first five books of Peck's *Manual*.
2. *Geometry*: the first four books of Davies' *Legendre*.

COLLEGIATE COURSE.

In this course the amount prescribed in each department is such as to make it practicable for the student to pursue all the studies simultaneously, provided that only one foreign language be taken.

I.—ENGLISH LANGUAGE AND LITERATURE.

FIRST YEAR.

First term.—Bain's *Higher English Grammar*, edition of 1880, *Syntax and Analysis*, pp. 264–331.

Quackenbos's *Course of Composition and Rhetoric* (revised edition), pp. 56–126.

S. Brooke's *English Literature*, edition of 1883, pp. 1–108.

Addison, *Selections from Spectator*, edited by Arnold, 1878, pp. 122–157.

(To be read with regard to the opinions expressed, to the arrangement, to the historical and literary allusions, and to the syntax and analysis of sentences.)

Second term.—Bain's *Higher English Grammar*. *Parts of Speech*, pp. 14–114.

- Quackenbos's Course of Composition and Rhetoric, pp. 126-150 and 325-400.
 S. Brooke's English Literature, pp. 108-185.
 De Quincey, Essay on Conversation: Putnam's Prose Masterpieces, I., pp. 61-106.
 (To be read as stated above for the Spectator papers.)

SECOND YEAR.

- First term.*—Lounsbury's History of the English Language, pp. 1-147.
 Quackenbos's Rhetoric (revised edition), pp. 223-282.
 Shakespeare's Love's Labour's Lost (*ed. by Rolfe*); analysis of plot of play, with discussion of language, figures, and allusions in Acts I. and II.
 Morley and Tyler's Manual of English Literature, pp. 151-336.
Second term.—Lounsbury's History of the English Language, pp. 151-355.
 Bain's Higher English Grammar, Derivation of Words, pp. 203-263.
 Quackenbos's Rhetoric, pp. 151-223, 282-325.
 Shakespeare's Love's Labour's Lost, Acts III., IV., V.
 Morley and Tyler's Manual of English Literature, pp. 336-525.

THIRD YEAR.

- First term.*—Bain's Composition and Rhetoric, pp. 19-121.
 Arnold's Manual of English Literature—Critical Section, pp. 341-456.
 Sweet's Anglo-Saxon Primer, pp. 1-22.
 Bacon's Essays, edited by Wright, eight essays, pp. 131-155, with explanation of difficult words, and constructions, discussion of figures of speech, and historical and literary allusions, and study of Bacon's Life (Church's preferred).
Second term.—Bain's Composition and Rhetoric, pp. 110-152, and 257-294.
 Arnold's Manual of English Literature, pp. 457-517.
 Sweet's Anglo-Saxon Primer, pp. 22-61, and 79-89.
 Milton's Paradise Lost, edited by Browne, Books VI.-VIII. (notes included), with explanation of difficult words and constructions, discussion of figures of speech and historical and literary allusions, and study of Milton's Life (Pattison's preferred).

One essay, on subject approved by the professor, to be written and submitted during each term (1,500 words at least).

FOURTH YEAR.

First Term.—Bain's Composition and Rhetoric, Part Second, pp. 153–257.

Sweet's Anglo-Saxon Reader, ed. of 1884; Grammatical Introduction, pp. xi.–cii., and pp. 16–23 of prose text for translation, and explanation of forms and syntax.

Freeman's Essay on Race and Language, in Putnam's Prose Masterpieces, III., pp. 55–147, to be studied in respect of subject-matter and of construction of sentences and paragraphs.

Second Term.—Sunmere's Handbook of Poetics, pp. 133–242.

Sweet's Anglo-Saxon Reader, pp. 138–148, for translation and explanation of forms and syntax.

Chaucer's Poetry in Sweet's Middle English Primer, Second Part, pp. 1–24 and 72–97, for translation into modern English, and explanation of forms, syntax, and historical and literary allusions.

Two essays to be written, one for each term, on subject approved by the professor (2,500–3,000 words).

II.—MODERN LANGUAGES AND FOREIGN LITERATURE.

The elementary course for the first year will be the same in each language as the requisitions above given for admission to the advanced course.

FRENCH.

Second year for elementary, and first for advanced students.
Chardenal's Second French Course.

Roulier's Second Book of French Composition.

Brachet and Dussouchet's Petite Grammaire Française, Part II.

E. About: La Mère de la Marquise.—L. Halevy: L'Abbé Constantin.—Geo. Sand: La Mère au Diable.—H. Gréville: Dosia.

Composition.

Third year for elementary, and second for advanced students.

Two courses are offered in this year—

First course (practical);

Modern Comedies:—Augier et Sandeau: Le gendre de M. Poirier.—E. Pailleron: Le Monde où l'on s'Ennuie.—

O. Feuillet: *Le Roman d'un Jeune Homme Pauvre*.—A. Belot: *Le Testament de César Girodot*.

Chassang's *Grammaire Française* (Cours Moyen). Translating from C. Mackay's *A Thousand and One Gems of English Prose*.

Second course (literary);

Study of the masterpieces of the great writers of the seventeenth century:—Molière: *L'Avare*—*Don Juan*—*Le Misanthrope*.—Corneille: *Le Cid*—*Polyeucte*.—Racine: *Andromaque*—*Athalie*.—Pascal: *Les Lettres Provinciales*.—La Bruyère: *Les Caractères*.—Bossuet: *Les Oraisons Lunébres*.—Fénelon: *Télémaque*.—D. Nisard: *Histoire de la Littérature Française*.—Paul Albert: *La Littérature Française au XVIIe Siècle*.

Fourth year for elementary, and third for advanced students.

Two courses are offered in this year—

The first course, wholly in French, will be of a literary character;

The study of the masterpieces of the eighteenth and nineteenth centuries:—Voltaire: *L'Essai sur les Mœurs*.—J. J. Rousseau: *Le Contrat Social*.—Diderot: *Le Paradoxe sur le Comédien*.—D'Alembert: *Le Discours Préliminaire sur l'Encyclopédie*.—Madame de Staël: *De l'Allemagne*.—Victor Hugo: *Hernani*—*La Légende des Siècles* (Ière Série).—Lamartine: *Jocelyn*.—Augier: *Maître Guérin*.—Villemain: *Lascaris*.—Mérimée: *Colomba*.—Paul Albert: *Histoire de la Littérature Française au 18e et 19e Siècles*.

The second course (philological);

Brachet's *Grammaire Historique de la Langue Française*.—Darmesteter and Hatzfeldt's *Morceaux Choisis des Écrivains du 16e Siècle*.—Leon Gautier: *Chanson de Roland*.

Lectures.

During the academic year a course of twenty public lectures in French will be delivered on the classical writers of the seventeenth century. Special attention will be given to Molière, Corneille, Racine, La Fontaine, Pascal, La Bruyère, La Rochefoucauld, Madame de Sévigné, Bossuet, and Fénelon.

The lectures will be delivered on Saturdays, at 11 A.M.

GERMAN.

Second year for elementary, and first for advanced students.

1. Schiller's Wilhelm Tell, and one hundred pages from Hart's selections from Goethe's prose.
2. Second part of Stahl's Versions.
3. German conversation.

As book of reference, Whitney's German Grammar.

Third year for elementary, and second for advanced students.

1. Goethe's Faust, Part I., with the commentary in Boyesen's Goethe and Schiller. (Walpurgisnacht and Walpurgisnacht Traum are omitted.)
2. Translations from English authors.
3. History of German literature: Scherer's History of German Literature.
4. German conversation.

Fourth year for elementary, and third for advanced students.

1. Lessing's Laokoön, and Nathan der Weise; Buchheim's Deutsche Lyrik, or, as substitute for the latter, Julian Schmidt's Charakterbilder aus der Zeitgenossischen Literatur.
2. History of German literature; Scherer's History of German Literature; Boyesen's Goethe and Schiller.
3. German conversation.

ITALIAN.

First year (elementary).

Sauer's Italian Grammar.

Stoppani's Il Bel Paese.

Translation from English into Italian.

Second year (first year advanced).

Selections from Puccianti's Antologia della Prosa Moderna.

Modern plays: I Mariti, of Torelli; Acquazzoni in Montagna, of Giacosa; Goldoni e le Sue Sedici Commedie nuove, of P. Ferrari.

Translating from Macaulay's essays on Italian writers.
Italian conversation.

Third year (second year advanced).

Manzoni's I Promessi Sposi.

Modern poetry: Selections from Puccianti's Antologia della Poesia Moderna.

Italian composition.

History of Italian literature: modern period.

Fourth year (third year advanced).

Study of Dante, and readings from Italian literature:

course suggested—historical development of the Italian language; history of Italian literature, early and middle periods.

SPANISH.

First year (elementary).

Josse's Grammar.

One book of Gil Blas.

Sixty pages of Mantilla Libro de Lectura.

Second year (first year advanced).

1. Gramática Castellana por la Real Academia (for reference).

2. Ochoa's Piezas Escogidas: El si de las Niñas, of Moratin.

3. Don Quijote; one book.

4. La Familia de Alvareda por Fernan Caballero.

5. Translations from English.

Third year (second year advanced).

Ticknor's History of Spanish Literature; modern period.

Selections from Ochoa's Poesias Escogidas.

Ochoa's Piezas Escogidas: Si no Vieran las Mujeres, of Lope de Vega.

La Vida es Sueño, of Calderon; El Desden con el Desden, of Mareto.

Fourth year (third year advanced).

Ticknor's History of Spanish Literature; early and middle periods.

Selections from earliest monuments: course suggested—Romancero del Cid.

Spanish essays.

III.—LATIN LANGUAGE AND LITERATURE.

FIRST YEAR.

1. The first book of the Odes of Horace.
2. Latin syntax and prosody, with the scanning of Horace.
3. Cicero, de Senectute and de Amicitia.
4. Latin prose composition.

SECOND YEAR.

1. One book of the Epistles of Horace.
2. Review of Latin prosody; Latin etymology.
3. Tacitus, Agricola and Germania. Latin prose composition.

THIRD YEAR.

1. Five Satires of Juvenal.
2. One book of Cicero de Officiis.
3. Latin composition in prose and verse.

FOURTH YEAR.

1. One play of Plautus, with a selection of the metres.
2. Archaic Latin, and Latin orthography.
3. Cicero, Select Letters.
4. History of Latin literature, the compendium by Dr. Schmitz.

IV.—GREEK LANGUAGE AND LITERATURE.

FIRST YEAR.

1. Homer's *Odyssey*, three books; Homeric forms and syntax.
2. Scanning and prosody.
3. Seventh book of *Herodotus*.
4. Syntax of the moods.
5. Greek prose composition.

SECOND YEAR.

1. The *Medea*, *Hippolytus*, or *Iphigenia in Tauris*, of *Euripides*.
2. Choral scanning.
3. *Xenophon's Memorabilia*; two books.
4. Greek prose composition.

THIRD YEAR.

1. One drama of *Sophocles*.
2. Choral scanning.
3. The *Protagoras*, *Phædo*, or *Apology* and *Crito* of *Plato*.
4. Greek prose composition and Greek versification.

FOURTH YEAR.

1. One drama of *Æschylus*; or the *Olympic* or *Pythian Odes* of *Pindar*.
2. Choral scanning.
3. *Demosthenes*—*Oration on the Crown*; or sixth and seventh books of *Thucydides*;—or
4. History of Greek literature; elements of comparative philology.

V.—MATHEMATICS.

FIRST YEAR.

1. Geometry, plane and spherical—Davies' Legendre.
2. Logarithms and the use of logarithmic tables.
3. Algebra, including Sturm's theorem and the general demonstration of the binomial theorem—Peck.
4. Application of algebra to geometry—Davies' Legendre.
5. Determinants—Peck's Elements.

SECOND YEAR.

1. Plane, analytical, and spherical trigonometry—Davies' Legendre.
2. Mensuration of surfaces and volumes—Davies' Legendre.
3. Surveying and leveling—Davies (revised edition).

THIRD YEAR.

1. Analytical Geometry—Peck.
2. Mechanics—Peck.

FOURTH YEAR.

1. Differential and integral calculus—Peck.
2. Astronomy—Peck.

VI.—HISTORY AND POLITICAL SCIENCE.

For students who take a full course, this study should commence in the second year.

First year of history ; second of the collegiate course.

1. German history—Freeman's Historical Course.
2. French history—Freeman's Historical Course.

Second year of history ; third of collegiate course.

1. English history—Freeman's Historical Course.
2. Elements of political economy—De Laveleye.

Third year of history ; fourth of collegiate course.

1. Constitutional history of Europe—Hallam.
2. Constitutional history of the United States.

VII.—PHYSICS AND CHEMISTRY.

For students who take a full course, this study should begin in the second year.

First year of chemistry ; second of the collegiate course.

Chemistry—Fownes' Manual of Chemistry—12th edition—non-metallic elements.

Second year of chemistry and physics; third of the collegiate course.

Ganot's Physics, including heat, magnetism, and electricity.

Third year of chemistry and physics; fourth of the collegiate course.

1. Ganot's Physics—optics and acoustics.

2. Chemistry—Fownes' Manual of Chemistry—12th edition—metals—organic chemistry.

VIII.—NATURAL HISTORY.

First year of natural history; third of the collegiate course.

1. Botany—Gray's Structural Botany.

2. Mineralogy—Manual of Mineralogy and Lithology, Dana.

3. Zoölogy—Packard.

Second year of natural history; fourth of collegiate course.

1. Botany—Bessey.

2. Geology and palæontology—Dana.

3. Zoölogy—Huxley's Elements of Practical Biology.

IX.—MORAL AND INTELLECTUAL PHILOSOPHY.

First year of philosophy; third of collegiate course.

First Term.—Logic.

Jevons's Lessons in Logic.

Mill : Logic, Books, I., II., and III.

Venn : Symbolic Logic.

Or,

McCosh's Logic.

Liard : Les Logiciens Anglais Contemporains.

Ueberweg : System of Logical Doctrine.

Second Term.—Psychology.

Sully : Outlines of Psychology.

Murray : Hand-book of Psychology.

Taine : On Intelligence.

Or,

Wundt : Physiologische Psychologie.

Second year of philosophy; fourth of collegiate course.

First Term.—Ethics and History of Ancient and Mediæval Philosophy.

Calderwood : Hand-book of Moral Philosophy.

Benn : The Greek Philosophers.

Ueberweg : History of Philosophy, Vol I.

Second Term.—Ethics and History of Modern Philosophy.
Janet: Theory of Morals. Final Causes.
Bowen: Modern Philosophy.
Ueberweg: History of Philosophy, Vol. II.

NOTE.—Whenever text-books are named in the foregoing programme, it is to be understood that the purpose is to indicate the amount that will satisfy the requirements, rather than the specific forms in which the study of the subject-matter shall be pursued. Students will be permitted to offer any other books on the same subjects, provided those so offered are as comprehensive as those named, or more so. But as, in all cases, full equivalents will be demanded, it will be well for those who would prefer a different book in any subject, to make known their wishes to the faculty some months in advance of the examination on the subject to which such book relates.

EXAMINATIONS.

There will be held two examinations on the studies of the collegiate course every year—one, called the intermediate examination, commencing on the last Monday in January, and the other, called the concluding examination, on the Monday of the third week preceding commencement.

DEGREES.

1. The degree of bachelor of arts will be conferred on such students as shall have pursued, during four years, a course of study fully equivalent to that for which the same degree is conferred in the School of Arts, and shall have passed all the examinations required.

2. Any woman who shall have taken the degree of bachelor of arts in the Collegiate Course for Women, may study for higher degrees under the direction of the faculty of the college.

3. Women graduates of other colleges in good repute, who shall have satisfied the faculty of the college that the

course of study for which they have received their degrees is equivalent to that for which similar degrees are conferred in the Collegiate Course for Women, or shall have passed such examination as the faculty may prescribe, may be admitted to higher degrees on the same terms and conditions as are prescribed for the admission of graduates in the Collegiate Course for Women to the same degrees.

NOTE.—For regulations as to higher degrees, and courses of study therefor, see Circular of Information, School of Arts.

CERTIFICATES.

To students not pursuing the full course required for the degree of bachelor of arts, but limiting themselves to one or more courses of inferior range, a certificate of proficiency in the subjects pursued will be given, on the satisfactory completion of such course or courses of study, to be signed by the president of the college and the examining professor or professors.

SPECIAL STUDENTS.

Special students may be admitted to the Collegiate Course for Women. No entrance examination is required of such students, except such as may be necessary to ascertain whether they are qualified to pursue with profit the special course for which they apply.

CALENDAR.

- 1887—May 31.—Examinations for admission begin, Tuesday.
Sept. 26.—Examinations for admission begin, Monday.
Oct. 3.—First term of the scholastic year begins, Monday.
- 1888—Jan. 30.—Intermediate examinations begin, Monday.
Feb. 8.—First term ends, Wednesday.
Feb. 9.—Second term begins, Thursday.
May 21.—Concluding examinations begin, Monday.
June 4.—Examinations for admission begin, Monday.
June 13.—Commencement, Wednesday.

COLUMBIA COLLEGE

SCHOOL OF MEDICINE

(COLLEGE OF PHYSICIANS AND SURGEONS)

GENERAL STATEMENT.

NEW BUILDING.

ON October 18, 1884, the school received from the late WILLIAM H. VANDERBILT the gift of twenty-nine contiguous city lots of land, costing two hundred thousand dollars, and of three hundred thousand dollars in money, wherewith to erect upon this land a new building, suited to the present needs of medical education.

The corner-stone of the new building was laid on April 24, 1886, with appropriate ceremonies.

This building, which will stand immediately opposite to the Roosevelt Hospital, will be completed by August 1, 1887, and the session of 1887-88 will be held therein, with full realization of immensely increased facilities for teaching and research.

On a portion of the land given to the school, there is now in process of erection the SLOANE MATERNITY HOSPITAL OF THE COLLEGE OF PHYSICIANS AND SURGEONS, the gift of WILLIAM D. SLOANE, Esq., of New York, whose wife, a daughter of the late Mr. VANDERBILT, has endowed this hospital by making all of its thirty beds free in perpetuity.

The Maternity Hospital will be ready to receive cases and to give instruction in the spring of 1887. Its service will be under the direction of the Professor of Obstetrics; its resident staff will be appointed from among the graduates of the school; and the members of the graduating class will be required each to attend in the hospital a certain number of cases of midwifery.

Upon still another portion of the land given to the school, close to the latter and to the Sloane Maternity Hospital, work has begun upon the building of the VANDERBILT CLINIC OF THE COLLEGE OF PHYSICIANS AND SURGEONS, given and endowed, at a cost of \$250,000, by the

four sons of the late WILLIAM H. VANDERBILT, as a memorial of their father.

This building is to contain a dispensary, and every thing required for the reception and treatment of ambulant patients, together with a lecture room, and ample accommodation for the instruction of small classes in the practical diagnosis and treatment of all kinds of cases. All the clinical instruction will be given here, while the school building proper will be devoted to didactic and laboratory teaching, and to research.

THE SCHOLASTIC YEAR

Consists of a single session of seven months, interrupted by a vacation of a few days at Thanksgiving-time, a second vacation of a week at Christmas, and the legal holidays.

The session of 1887-88 will begin on Monday, October 3d, and will end during the first part of May.

The spring examinations will be held at the end of the session, and will be followed by the annual commencement.

INSTRUCTION.

The instruction consists of didactic lectures, with demonstrations, clinical teaching, recitations, and practical teaching in subjects involving manipulation.

I.—LECTURES.

From two to six didactic lectures, appropriately illustrated by drawings and demonstrations, are given daily by the faculty during the scholastic year, on the following subjects, viz.: 1, anatomy; 2, physiology and hygiene; 3, physics, chemistry, and medical jurisprudence; 4, materia medica and therapeutics; 5, obstetrics and the diseases of women and children; 6, surgery; 7, pathology and practical medicine. Attendance upon the above courses of lectures is a prerequisite for graduation.

CARTWRIGHT LECTURES OF THE ALUMNI ASSOCIATION.—According to the provisions of the Cartwright Trust, there is annually given, under the auspices of the alumni association, a course of lectures more especially addressed to graduates in medicine.

II.—CLINICAL TEACHING.

For this method of instruction the facilities offered are unsurpassed, and are as follows :

SCHOOL CLINICS.

Ten clinics are held weekly, during the entire year, in the school building. Most of these clinics have been long established, are extensively resorted to by the sick poor, and constitute one of the most prominent out-patient services in the city. Over 3,000 cases are annually registered. The clinics cover all departments of medicine and surgery.

Attendance is optional, and admission free to matriculants.

HOSPITAL AND DISPENSARY CLINICS.

Besides the school clinics, the great hospitals and dispensaries of New York afford ample fields for clinical teaching. The school is strongly represented on the staffs of these institutions, and regular clinical instruction at hospitals and dispensaries, at hours that do not interfere with the didactic lectures, is made a prominent feature of the curriculum. Attendance is optional, and admission is free to matriculated students. At all the following hospitals and dispensaries instruction is given by officers of the school :

BELLEVUE HOSPITAL, 26th street and East River.—This is one of the largest general hospitals in the country. It has 800 beds, and receives annually over 10,000 medical, surgical, and uterine patients. The service covers a great range of practice, and presents an invaluable field for clinical instruction.

THE OUT-DOOR POOR DEPARTMENT of Bellevue Hospital receives annually for dispensary treatment over 30,000 cases. Here the special courses in physical diagnosis are given.

CHARITY HOSPITAL, Blackwell's Island, receives nearly 8,000 patients annually, of whom a large number are cases of chronic affections. This hospital offers a peculiarly rich field for the study of venereal disease, over 2,000 such cases being received yearly, and clinical instruction is here given by a member of the faculty.

ROOSEVELT HOSPITAL, 59th street and 10th avenue.—This hospital is built according to the most approved modern plans, and is elaborately appointed. It accommodates 180 patients, and treats annually over 2,000 in-patients and 15,000 out-patients. Clinics are held by members of the faculty.

NEW YORK HOSPITAL. — This, the oldest of the general hospitals of the city, was reopened in 1877 upon a new site in 15th street, between 5th and 6th avenues, in buildings of the latest construction, and fitted to accommodate 150 beds, as well as the superb museum and library of the hospital. More than 3,000 patients are annually treated. Clinical lectures are given in its theatre.

NEW YORK HOSPITAL OUT-PATIENT DEPARTMENT.— Clinical instruction is given here in diseases of children.

WOMAN'S HOSPITAL IN THE STATE OF NEW YORK, between 49th and 50th streets, Lexington and 4th avenues.— The hospital is especially devoted to the diseases peculiar to women. Several hundred of the surgical operations peculiar to gynecology are annually performed therein. Clinics are held thereat, to which a certain number of advanced students are especially invited each week during the session to witness the performance of operations.

DEMILT DISPENSARY, 23d street and 2d avenue.— This is a general dispensary, where out-patients are prescribed for. More than 20,000 cases are annually registered.

MANHATTAN EYE AND EAR HOSPITAL, corner 41st street and Park avenue. — This hospital has 50 beds, and a daily dispensary service is held for diseases of the eye, ear, and throat. Some 8,000 cases are annually registered. Clinical instruction is given here and, also, instruction in electro-therapeutics and nervous diseases.

NEW YORK EYE AND EAR INFIRMARY, 13th street and 2d avenue.— This is the largest institution of its kind in the country. It has 60 beds for house-patients, and a dispensary service for out-patients is held daily. During the year over 16,000 cases are registered. Clinical instruction is given by members of the faculty. It is here, also, that the special courses in otology and in laryngoscopy are given.

Besides the above-mentioned, there are numerous other hospitals and dispensaries, both general and special, to which the student can resort for observing disease.

III.—RECITATIONS.

The great value of systematic examinations in accurately fixing the knowledge of the student is too obvious to need discussion. Provision is made for examination on the subjects taught in the didactic lectures, by a system of recitations held by a corps of examiners at the school. Recitations are held daily, at hours that do not interfere with those of the lectures.

Fees.—Full course, \$50; any single branch, \$10.

IV.—PRACTICAL INSTRUCTION.

This kind of instruction is indispensable to train the hand, eye, and ear of the student for their work in diagnosis and treatment. The following are the advantages offered in this direction, but it is optional with the student whether or not to avail himself of them, excepting in the case of practical anatomy.

PRACTICAL ANATOMY.—A proper knowledge of human anatomy can be gained only by dissection. Every student is expected to dissect, and for this purpose a large, completely appointed dissecting room, ample for all, is provided in the school building. It is open from October 1st to May 1st, during which time the demonstrator and an assistant demonstrator are one or both present during the afternoons and evenings. Demonstrator's fee, \$10, good for a scholastic year.

NORMAL AND PATHOLOGICAL HISTOLOGY, URINARY ANALYSIS, AND CLINICAL MICROSCOPY are taught in a laboratory founded in 1878 by the alumni association, for the use of students and practitioners of medicine, and called "THE PHYSIOLOGICAL AND PATHOLOGICAL LABORATORY OF THE ALUMNI ASSOCIATION OF THE COLLEGE OF PHYSICIANS AND SURGEONS."

Instruction is given by the director of the laboratory and his assistants, in normal and pathological histology, in courses of forty lessons each. The student is taught in these courses the methods of preparing and studying tissues and organs, and makes, for his own future use, collections of microscopical specimens, from which he prepares a series of outline sketches. Fee for each course, \$20. The pathological course embraces the methods of studying the bacteria, and their relations to disease. A practical course is given to students and practitioners in urinary analysis and clinical microscopy. This course includes the examination of urine, calculi, blood, sputa, abdominal fluids, the more common animal and vegetable parasites, etc., and embraces about twenty-four lessons. Fee for the course, \$12. Students are advised to take each of these courses at some time during the period of undergraduate study, and it is usually most advantageous to take the course in normal histology during the first year, and the courses in pathological histology and clinical microscopy during the second and third years. A special course is given in microscopical technology. This course includes the general methods of hardening, staining, section-cutting, injecting, etc.; the use of high powers, polarizer,

micro-spectroscope, hæmacytometer, etc., and includes practical exercises in the methods of staining and cultivating the bacteria. This course is not limited in time, is designed for advanced workers, and is varied in scope to suit the needs of the individual. The student has the privilege of working in the laboratory at all hours of the day. Fee per month, \$20. Special practical instruction is given in the normal and pathological histology of the nervous system. Opportunity is afforded to a limited number of students or practitioners of making special or original investigations in the themes taught in the laboratory.

OPERATIVE SURGERY.—Instruction is given in this branch in the school building. Students are practised in operating upon the cadaver. Class members, 6; lessons, 13 or 14, of from 1½ to 2 hours each; fee, \$20.

MINOR SURGERY.—Instruction in this subject embraces practice upon the manikin or cadaver, the application of bandages, and of the various dressings used in the treatment of wounds, fractures, dislocations, etc. Class members, 8; lessons, 12; fee, \$15.

PHYSICAL DIAGNOSIS.—Instruction is given in this branch throughout the year, upon the persons of patients. The material is ample, being supplied from the school medical clinic, and from the instructor's own clinic in the chest-class of the out-door poor department of Bellevue Hospital. Class members, 3; lessons, 15; fee, \$20.

OTOLOGY.—Instruction is given on this subject at the N. Y. Eye and Ear Infirmary. Class members, limited; lessons, 12; fee, \$12.

LARYNGOSCOPY AND RHINOSCOPY.—Courses of instruction are given to graduates in the practical use of the laryngoscope and rhinoscope, together with demonstrations of the pathology and treatment of diseases of the larynx, at the N. Y. Eye and Ear Infirmary. Arrangements may be made, by students, with the assistants of the clinic, for practical instruction in the use of the laryngoscope. Class, limited; lessons, 12; fee, \$12.

OBSTETRIC OPERATIONS.—Practical instruction in obstetric surgery on the phantom or manikin is given in the school building. The course includes the mechanism, diagnosis, and treatment of all the various presentations and positions, with instruction in obstetric manipulations and operations, and the practical application of all obstetric instruments. Each student performs the operations on fœtuses employed for demonstration. Lessons, 10–12; fee, \$15.

GRADUATION.

I. Candidates for the degree of doctor in medicine must have attended two full courses of didactic lectures on—1, anatomy ; 2, physiology ; 3, chemistry ; 4, materia medica and therapeutics ; 5, obstetrics ; 6, surgery ; 7, pathology and practical medicine.

The second of these two courses must have been given at this school during a regular session or sessions. No two consecutive courses of lectures will be held to satisfy the above requirements, if the said two courses shall both have begun during the same calendar year.

It is optional with a student who desires to graduate at this school, whether he shall complete his attendance upon the required two full courses of lectures in two sessions, or shall complete such attendance in three or more sessions, by attending during certain sessions the lectures upon certain branches only.

Such students as can possibly afford the time are earnestly recommended to distribute the required studies over three sessions, as follows, viz.:

First session : physics and chemistry ; anatomy and practical anatomy ; physiology.

Second session : all the seven branches enumerated under the head of "Lectures."

Third session : materia medica and therapeutics ; pathology and practical medicine ; surgery ; obstetrics and gynecology.

A large majority of the students now grade their studies according to the above plan.

II. Candidates must have pursued the study of practical anatomy during one regular session of this school, or one regular session of some other regular school.

III. Candidates must have studied medicine thirty-six months, under the direction of a regular physician or surgeon, have attained the age of twenty-one years, and be of good moral character. Full certificates attesting these facts must be furnished. The three years of medical study required by law must be exclusive of any time spent as an undergraduate at a non-medical institution ; but the two years' course styled "Preparatory to the Study of Medicine," at the Cornell University, the Sheffield Scientific School of Yale College, or the Johns Hopkins University, is accepted in place of six months' study with a preceptor.

in the case of a student who afterwards attends three sessions at this school. The phrase "regular physician or surgeon" is used in the sense commonly understood in the medical profession. Certificates of preceptorship from eclectic, homœopathic, or other so-called "irregular" practitioners will not be received, even if such practitioners be graduates of regular medical schools.

IV. Each candidate is required to deposit with the secretary of the faculty a thesis on some medical subject, written by himself, and to pass a satisfactory examination before the faculty in the seven branches of medical science taught in the "required" lectures of the session.

A candidate who has completely failed to pass his examination for the degree of doctor in medicine may appear a second time at some stated period of examination (see below); but if, on so appearing, he should, a second time, completely fail, he must thereafter matriculate, and attend, at this school, a third full course of lectures in all branches, before he is allowed to appear a third time for examination.

A candidate is admitted to the said third course of lectures on payment of the matriculation fee only.

The diploma of this school is recognized in Great Britain and Ireland, as evidence of three years' medical study, by all bodies which confer the degrees of bachelor in medicine (M.B.), master in surgery (C.M.), and doctor in medicine (M.D.).

Graduates who are masters in arts of certain American academic colleges, among which are Columbia, Harvard, Yale, Princeton, and Amherst, are not required to pass examinations in arts and science before proceeding to the degrees of M.B., C.M., and M.D. in the United Kingdom.

Graduates may become licentiates of the Royal College of Physicians of London, Edinburgh, or Dublin, by passing a satisfactory examination, without previous residence in the United Kingdom.

Graduates may become licentiates of the Royal College of Surgeons of London, Edinburgh, or Dublin, by becoming licentiates of one of the royal colleges of physicians above mentioned, and passing a satisfactory examination, without previous residence.

The above conditions, under which graduates of this school are admitted to degrees and licenses in Great Britain and Ireland, apply equally to its graduates and to those of all other recognized medical schools in the United States.

EXAMINATIONS.

A student who has attended two courses of lectures, of which the second has been at this school, upon anatomy, physiology, and chemistry, or upon any one or two of these subjects, may appear for examination in such of the said subjects as he has so attended, upon the completion of his second course in the same; such an examination in any of the said subjects, if satisfactory, is accounted final, unless the candidate should be subsequently "rejected" for the degree of M.D. as set forth below. No two courses in any or in all of these three branches will be held to satisfy the above requirements, if the said two courses shall both have begun during the same calendar year.

A candidate who has been unsuccessful at any of the examinations above specified, is not eligible for re-examination in the branch or branches in which he has failed, until the time of his final examination for graduation.

The examinations under the above rule, and for the degree of doctor in medicine, are in writing, and are held twice a year, viz.:

1. Immediately after the close of the lectures of the scholastic year.

2. During the third and fourth weeks of September.

According to the merits of his thesis and examinations, three results of the latter are possible in the case of a candidate for the degree of M.D.:

1. He is "passed" when his thesis and examinations have been satisfactory in each and all of the seven branches of medical teaching enumerated under the head of "Lectures."

2. He is "conditioned" when the average merit of his thesis and examinations has been satisfactory, while in one or more branches he has been found deficient. In this case the candidate can proceed to his degree only on the condition that he shall first pass a re-examination in the deficient branch or branches, not sooner than at the next regular semi-annual examination.
3. He is "rejected" when the average merit of his thesis and examinations has been unsatisfactory; in this case the candidate must be re-examined in all the seven branches, but the writing of a new thesis is rarely required.

HOSPITAL APPOINTMENTS.

By a resolution of the Commissioners of Public Charities and Correction, this school is entitled to nominate for appointment by the commissioners, after competitive examination in the school, its proportion of members of the house staff of Bellevue Hospital; such members to be attached to that division of the said hospital which has been assigned to the care of the school.

These nominees will all serve the hospital for six months in each of the three grades of junior assistant, senior assistant, and house physician or house surgeon; each one having thus a total of eighteen months' experience in the "House Staff."

Four nominations, two medical and two surgical, are made each year by the school, under the above resolution.

One medical and one surgical assistant go on duty upon June 1st; one medical and one surgical assistant upon December 1st.

The four nominations for each year are offered to those members of the graduating class (including those who passed their examinations in September of the preceding year) who have passed the best examinations for the degree of M.D.

The choice as to character of service and time of beginning the same is given to the successful candidates in the order of their merit.

Similar positions are filled twice in each year by public competitive examination, open to graduates of this school, in the following institutions:

The "non-collegiate" division of Bellevue Hospital; the New York Hospital; the Roosevelt Hospital; St. Luke's Hospital; the Charity Hospital; St. Vincent's Hospital; St. Francis' Hospital; the German Hospital; the Mount Sinai Hospital; the Presbyterian Hospital; the Woman's Hospital; the Brooklyn City Hospital; St. Catharine's Hospital, Brooklyn; St. Peter's Hospital, Brooklyn; the Kings County Hospital, Flatbush, L. I.

EXPENSES.

ALL FEES ARE PAYABLE IN ADVANCE.

N. B.—Excepting one matriculation fee of \$5, the sum to be paid in necessary fees during a student's curriculum is

the same, whether that curriculum be completed in two sessions, or divided among three or more sessions.

The necessary expenses for graduation of a student who attends the recommended curriculum during three sessions, having taken no previous course at another regular medical school, are as follows :

FIRST SESSION.

Matriculation	\$5
Tickets for lectures in anatomy, physiology, and chemistry	60
Practical anatomy ticket	10
Anatomical material (at \$1 each " part ") not over	5
Total	<u>\$80</u>

SECOND SESSION.

Matriculation	\$5
Tickets for full course of lectures in all branches .	140
Total	<u>145</u>

THIRD SESSION.

Matriculation	\$5
Tickets for mat. med., practice, surgery, obstetrics	80
Graduation fee	30
Total	<u>115</u>
Total for the three sessions	<u>\$340</u>

For a student who graduates at the end of two sessions, the necessary fees are: *first session*, \$160; *second session*, \$175; *total*, \$335.

A matriculation fee of \$5 must be paid once in each scholastic year by every one who pursues any study, as a necessary preliminary to such study. Only graduates of this school and candidates for graduation thereat who have passed their examinations, are exempt from the action of this rule.

The fees for attendance upon the didactic lectures in one or more of the seven branches of study taught during the session are at the rate of \$20 for each branch.

A graduation fee of \$30 must be paid by every one who

receives the degree of doctor in medicine, before obtaining his diploma.

The fees for practical anatomy are given above.

Students who have already attended two full courses of lectures in other regular schools, and graduates of other regular schools, who will be of less than three years' standing at the end of a given session, are admitted to the full course of lectures of such session (not including practical anatomy) on paying the matriculation fee and \$70.

For attendance upon lectures in a less number of branches of study than the seven branches which make up a full course, such students and graduates will be granted no reductions in fees.

Students who have attended two full courses of lectures in this school, or who, having attended one full course of lectures in some regular medical school, have subsequently attended one full course of lectures in this school, are admitted to a third course (not including practical anatomy) on paying the matriculation fee only.

Graduates of this school, and candidates for graduation who have passed their examinations, are admitted without fee to all the didactic and clinical lectures of the scholastic year.

Graduates of other regular schools, who will be of three years' standing at the end of a given session, are admitted to all the didactic and clinical lectures of such session on paying the matriculation fee. No additional fee is required for admission to final examination. Theological students intending to appear for graduation in medicine, are required to pay the same fees as other students.

Absolutely no reductions or remissions of established fees are granted for any cause whatever.

Fees for optional special courses will be found under the head of such courses.

TEXT-BOOKS AND INSTRUMENTS.

Gray's Anatomy, \$4.80; *or* Quain's Anatomy, \$9.60; Holden's Dissector, \$4.00; Dalton's Physiology, \$4.00; Fownes' Chemistry, \$2.20; Ganot's Physics, \$4.00; Bartholow's Therapeutics and Materia Medica, \$4.00; E. Curtis' General Medicinal Technology, 80 cents; Bryant's Practice of Surgery, \$5.20; Playfair's Midwifery, \$3.20; *or*, Lusk's Midwifery, \$4.00; Thomas' Diseases of Women, \$4.00; Niemeyer's Practice, \$7.20; Delafield and Prudden's Pathological Anatomy and Histology, \$4.00.

For reference : Dunglison's Medical Dictionary, \$5.20; U. S. Dispensatory (leather), \$6.40; Ringer's Therapeutics, \$4.00; Foster's Physiology, \$2.60.

N. B.—The prices above given are liable to fluctuations, The latest editions only of text-books should be purchased by students.

A "dissecting case," containing all the necessary instruments, can be bought for \$3.00.

BOARD.

Board can be obtained at prices ranging from five to nine dollars a week.

PRIZES.

ALL PRIZES ARE PUBLICLY AWARDED AT THE COMMENCEMENT.

HARSEN PRIZES FOR CLINICAL REPORTS

Founded in 1859, by the late Jacob Harsen, M.D., a graduate of the College of Physicians and Surgeons.

Three annual prizes are offered for the best three reports, in writing, of the clinical instruction given at the New York Hospital during any four consecutive months of the year which ends on commencement day.

These reports must embrace the clinical teaching of both the visiting physician and the visiting surgeon on duty.

The prizes are as follows:

A first prize of one hundred and fifty dollars; a second prize of seventy-five dollars; a third prize of twenty-five dollars.

Together with each prize are given a Harsen prize medal and a diploma.

HARSEN PRIZES FOR PROFICIENCY AT EXAMINATION.

In consequence of the increase in value of the Harsen prize fund, there are awarded, in addition to the three prizes above mentioned, three

HARSEN PRIZES FOR PROFICIENCY AT EXAMINATION, VIZ.:

A first prize of five hundred dollars;

A second prize of three hundred dollars;

A third prize of two hundred dollars.

The award of these three prizes is made as follows :

The ten members of each graduating class who, at their examination for the degree of doctor in medicine, and in their graduating theses, have shown the highest proficiency in all the branches combined, receive each a diploma of "examination honors," and are entitled to take part in special competitive examinations, the three most meritorious competitors at which receive the first, second, and third prizes, respectively.

The competitive examinations consist :

I. Of a public examination in writing, conducted by a committee of the faculty, and covering all the seven branches of medical teaching ;

II. Of an examination upon the cadaver in practical anatomy, conducted by the professor of anatomy ;

III. Of practical examinations in clinical medicine and clinical surgery, conducted at the hospitals by the professors of medicine and surgery, respectively.

The relative merits of the competitors are decided, and the award of the prizes made, by a committee of three judges, consisting of the president of the school, the president of the association of the alumni, and of a resident alumnus selected by them.

ALUMNI ASSOCIATION PRIZE.

This is a prize of five hundred dollars, open for competition to the alumni of the school. It is awarded to the best medical essay submitted upon any subject the writer may select.

If no one of the competing essays be deemed sufficiently meritorious, the prize is not awarded.

An essay, in order to be held worthy of the prize, must contain the results of original investigations made by the writer.

Essays in competition for the prize to be awarded at commencement must be sent to a member of the prize committee appointed the preceding year, on or before a date specified in the annual catalogue.

Competing essays must each be marked with a device or motto, and accompanied by a sealed envelope, similarly marked, containing the name and address of the author.

CARTWRIGHT PRIZE OF THE ALUMNI ASSOCIATION.

This prize consists of five hundred dollars, and is offered for competition in alternate years with the alumni association prize.

It is awarded on the same terms as the latter, except that it is open to universal competition.

STEVENS TRIENNIAL PRIZE

Established by the late Alexander Hodgdon Stevens, M.D., formerly president of the College of Physicians and Surgeons, on the following plan :

The prize, awarded triennially, consists of the interest yielded by the principal fund during three years, and amounts to two hundred dollars.

The administration of the prize is entrusted to a commission, consisting of the president of the College of Physicians and Surgeons (*ex-officio*), the president of the alumni association (*ex-officio*), and the professor of physiology (*ex-officio*) in the same institution.

The prize is awarded to no essay unless it includes the results of original research by the writer upon the subject chosen.

In 1888 this prize will be given to the best *medical essay* submitted upon any subject the writer may select.

The competing essays must be sent to the president of the College of Physicians and Surgeons, New York, on or before the first day of January, 1888. Each essay must be designated by a device or motto, and must be accompanied by a sealed envelope, bearing the same device or motto, and containing the name and address of the author. The envelope belonging to the successful essay will be opened, and the name of the author announced, at the annual commencement in 1888 ; at which time, also, the subjects for the next triennial prize (1891) will be announced.

This prize is open for universal competition.

JOSEPH MATHER SMITH PRIZE.

The fund for this prize is given by the relatives, friends, and pupils of the late Dr. Smith, as a memorial of his services as professor in the College of Physicians and Surgeons from 1826 to 1866. Under the provisions of the trust, an annual prize of one hundred dollars is awarded for the best essay (if sufficiently meritorious) on the subject of the year, presented by an alumnus of this school. The prize committee, consisting of the president of the school, the professor of pathology and practical medicine, and the president of the alumni association, designate each year the subject for the following year. The competing essays

should be sent to the president on or before March 10th, each essay signed with a device or motto, and accompanied by a sealed envelope, inscribed with the same device or motto, and containing the name of the author. The envelope of the successful essayist will be opened, and the prize awarded, at the annual commencement next following.

COLUMBIA COLLEGE

LIBRARY

SCHOOL OF LIBRARY ECONOMY

THE LIBRARY.

In the fall of 1883 the eight independent collections of Columbia College, besides small department libraries, were consolidated into one university library, and an entire reorganization of the staff and methods was made, in keeping with the new provisions for storage and use of books. No expense was spared to make the building and its equipments unsurpassed in practical convenience for readers. Additions, privileges, and assistance offered have been correspondingly increased.

An efficient staff of four librarians and twenty assistants aim to make the library as useful as possible to the largest number.

The consolidated collections, with the 8,000 volumes of the Academy of Science deposited with them, now aggregate over 90,000 volumes. The average annual increase is about 10,000 bound volumes, and as many more unbound volumes and pamphlets. Care is taken to select the best books, and there is an unusual number of specially valuable works for a library of this size. The rapid growth of the collection seems now assured.

Privileges.—Members and graduates of all the schools have the privileges of the combined libraries. Both reference and loan departments are open from 8 A.M. to 10 P.M., throughout the year (except Sundays and Good Friday), including all holidays and vacations.

Some 40,000 volumes are on the shelves of the great hall, the loan room, and the Political Science reading-room, open freely to all readers, and permits to work at the shelves in the stack rooms are given to students needing such extra privileges, as are also tickets to the six smaller reading-rooms for special research. As no catalogue can equal in usefulness the handling of the books themselves, unusual provision is made for working freely with the whole literature of subjects instead of with a few selections from the

catalogue. Such a privilege through a series of years is an education in itself.

To make this shelf work more practicable, labels giving individual subjects are freely hung on the shelves, and printed tables of the classification give a general view. When bound, books are lettered with the most needed facts as legibly as possible. No Roman numerals, German or fancy types are used, and since 1883 the color of the binding shows in what language the book is printed. Thin annuals, catalogues, reports, etc., are bound uniformly by full or half decades.

By means of book-shaped cases of wood of various sizes and stout manila cases for single thin pamphlets, newspaper clippings mounted on manila sheets, and pamphlets or material in ms., worth preserving, are all kept beside the books on the same subject, thus enabling readers, as far as is possible, to see together all the resources on each of the more than 10,000 topics into which the library is carefully divided. Thin wood dummies represent books on the same subject, which are not in their regular places because of extra size, rarity, or need on the reference shelves. A label on the side of the dummy tells why the book is removed and where it may be found. In every detail the convenience of readers is carefully studied.

Students as well as officers may borrow books for home reading, and if the book asked for is not in it may be reserved, and notice is sent the applicant when it comes. When there is special demand for any book of the lending library, it is temporarily withheld from circulation or put on the reference shelves behind the desks of the reference librarians, in order to insure all an equal opportunity for consultation.

Unusual precautions are taken to secure quiet for study. All chairs, doors, trucks, etc., likely to make noise, have rubber tips. To reach the higher shelves without the noise and annoyance of step-ladders, steps and handles are fitted to each upright. All departments are connected by electric bells, annunciators, and speaking-tubes. The bells are no louder than absolutely necessary, of different tones, single stroke, and indicate simple messages by strokes and intervals, without using the tubes. The tubes are laid with curves instead of angles, and transmit the lowest tones audibly, instead of requiring the voice to be raised, and the various tubes connect by switches, like the wires in a central telephone office. Much noise, loss of time, and confusion are

thus avoided. Book trucks, balanced on large rubber wheels, enable the pages to carry noiselessly and rapidly about the room or galleries 200 volumes at a time, and book trays, with rubber feet and broad carrying straps, serve a similar purpose for small loads. To further lessen the confusion of necessary moving about, the aisles are carpeted and the pages wear noiseless slippers.

All officers, graduates, and students of Columbia College have access to the reference library or may borrow books at any time during the 14 hours of daily opening, it being the library rule in this and all other respects to grant every practicable privilege, and afford every reasonable aid to readers. In the door of the chief librarian's room is a letter-box to receive recommendations of books to be added, notes, suggestions, or criticisms concerning the library or its management, either signed or anonymous, such evidences of active interest being received as favors.

To accommodate readers, postage and special delivery stamps, cards, pencils, note-books, and paper, and such other articles as readers are likely to need in the library, may be had at cost at the loan desk. Single sheets of paper, of postal, note, and letter sizes, are free at the librarians' desks, and the coat-room page fills fountain pens with black, blue, or red ink. At the entrance are toilet-rooms, running ice-water, bulletin boards with library and college notices, seats where conversation is allowed, a coat-room where bags, hats, umbrellas, books, etc., are checked, private shelves for readers wishing to leave books or papers without checking, a district telegraph call-box, and other conveniences. The college lunch-room adjoining the library provides, at low rates, lunch for readers not wishing to leave the grounds. A telephone gives immediate connection with all parts of the city.

On either personal or written application at the loan desk, the services of a copyist, short-hand-, or type-writer may be had for any work required, either at the cost of actual time used, or at the regular rate per folio for work done. Where special library investigation beyond what can properly be asked of the librarians is wished, skilled services may be had at actual cost of time consumed, counting each hour as $\frac{1}{200}$ of a month's salary. The library undertakes to accommodate by selecting for such work, from several available candidates, the person most likely to do it well and quickly, because of familiarity with the subject and the library. The cost of such services is from 25 cents to \$1 per hour, accord-

ing to the skill required. This plan enables those at a distance to have investigations made without the expense of a journey to the city. Where extracts need legal verification, a notary public in the building is provided with blanks, notarial seal, etc.

Services or articles which cannot be made entirely free without danger of abuse or unreasonable expense to the library, are charged for at actual cost, thus leaving most readers freer to use the accommodation than they would feel were it a pecuniary burden to the library. It is the aim of the library, in every detail, to enable readers to do the most possible with their time. The staff are glad to undertake any extra labor that promises a corresponding gain to the readers, and the chief librarian cordially invites suggestions of any practicable means of making the library still more useful.

Building.—Believing that a good library is essential to the success of every student, officer, and department, and that the best work can be done only with the best facilities, the college spent on its new fire-proof library building three years of time and over \$400,000 besides the land, and now offers students unequalled conveniences and privileges.

The library occupies the centre of the block, with the various schools surrounding it. The entrance gates, lawn, and terraces are lighted evenings throughout the year, and the various reading-rooms are cool in summer and uniformly warmed in winter. The powerful heating apparatus is under complete control. By thermometers hung in all the rooms, with electric signals to the chief engineer, careful attendants keep the temperature even.

Light.—The main reading-room is flooded with light from 9 north, 16 east, 24 south, and 14 west windows. Three hundred Edison electric lamps, run by the college engines, make every book and pamphlet as available by night as by day. The details of lighting were perfected by oculists, and readers unable to work by other lights find no difficulty with these. A gray tint on the glass protects weak eyes on bright days, and at night opaque shades throw the direct rays on the tables or the shelves, so that the eyes when raised meet no annoying glare. Every table has its own adjustable electric student lamp under the control of the reader, who may, if he prefers less light, substitute a lamp of lower power. No heat or impurity is given off, and the lamps are lighted or turned out by a simple touch.

Ventilation.—In each corner of the main hall 600 feet of steam pipes create a powerful exhaust, and with large registers 50 feet above the floor, besides 10 perpendicular registers supplying pure heated air on the floor level, the action is so perfect that at the close of a busy day, when the room has been filled, the air is not appreciably less pure than in the morning.

Reading-rooms.—The main hall is 113 feet long, 75 feet wide, and 58 feet high, and on all sides has a gallery reached at five points by short flights of straight iron stairs. There are 40 oak reading-tables fitted with extension slides and adjustable electric student lamps, where 160 readers can work at once with comfort. All tables are supplied with arm and desk chairs of bent wood, selected as most comfortable for protracted use. There are also oak seats holding two each, built in each window. The 30,000 volumes on the walls are open to all, and to aid readers in their studies three librarians have desks in the room.

There are six smaller reading-rooms to which admission is given by ticket to those needing their special advantages. These accommodate 100 more readers at their 25 tables, which are specially for graduate students.

The rights of readers to quiet in the reading-rooms are strictly maintained. Nothing that could annoy a sensitive reader is tolerated. Those wishing to converse, even in low tones, are required to retire to the outer halls where seats are provided and the rights of others are not violated.

Catalogues.—Besides the regular ms. book and card catalogues as used in the best libraries, the books are minutely classified on the shelves by trained cataloguers into over 10,000 subject-groupings. There is also a brief-entry subject catalogue in a separate book (shelf list) for each main class, an exhaustive catalogue and analysis on cards, and the fullest printed index of topics that has yet been arranged for library use. To insure greater legibility, uniformity, and compactness, the cards are now printed on type-writers.

Descriptions of all the catalogues, with suggestions for use, can be had without charge in the Reader's Handbook.

To all catalogues, indexes, and other aids and guides, readers have unrestricted access, day and evening, and training in the best methods of reading and consulting libraries is made an important factor in the college course. To this end, besides the personal efforts of the library staff and the college faculty, lectures, readers' manuals, guides, and the

aids that recent study of leading librarians has proved most valuable, are provided. At the opening of the college year, the chief librarian will meet new students and explain fully their rights and privileges and the best methods of utilizing the library and its various catalogues, indexes, etc.

The catalogues record not only all the books in the building, but also all owned by the college or any of its departments, with a note of their location printed on the upper margin. All works of art and historic interest are similarly registered.

The catalogue librarian, three cataloguers and classifiers, and three assistants are constantly engaged in putting the library into the most perfect working condition, and members of the staff are specially assigned to aid readers in each department.

Classification.—To enable students to see the resources of the library on any subject, great or small, an exhaustive classification on the shelves shows all books, periodicals, pamphlets, mounted newspaper clippings, and mss. on any given subject side by side. The printed alphabetical index gives at a glance the number of any subject, and the subject catalogue cards, shelves, etc., are arranged in simple numerical order. These numbers are also largely mnemonic, thus greatly simplifying their use and aiding the memory; *e. g.*, 942.105 on a pamphlet shows its numerical order on the shelves, and this number will be given after every entry on the alphabetical index that refers to the subject covered by the pamphlet. The number means, as will be seen readily by reference to the printed classification, "London in the time of the Tudors." Each figure has its meaning. 9 is history, 4 Europe, 2 England, 1 London. 0 means no farther geographical subdivision, and the time division is 5, *i. e.*, Tudor period. In the same way in the 4th place, 7 is Yorkshire, and 9 Wales, while in the 6th place 6 is Stuart period and 8 Victorian. Therefore 942.906 means Wales under the Stuarts, 942.708 Yorkshire in the Victorian period, etc.

This illustrates the minute indexing, analysis, and cross references which quickly send an investigator to the detailed material on his subject. More general works require fewer figures; *e. g.*, 942.06 is all England under the Stuarts, 942 is all England in all periods, 940 is the general history of Europe, limited to no one country, and 900 is universal history limited to no period and to no country. The numbers are simply decimals, the library being the unit. The

main classes are 1 Philosophy, 2 Religion, 3 Sociology, 4 Philology, 5 Natural Science, 6 Useful Arts, 7 Fine Arts, 8 Literature, 9 History. The divisions, sections, and sub-sections are printed in tabular form for convenient reference, the comparative rank of each subject being shown not only by the number of figures prefixed, but also by size of type, by style of type, and by indention. Explanations of the mnemonic and other special features of the classification, with suggestions for its use in preserving notes, clippings from papers, and for other purposes, can be had on application.

While classification thus includes all from the broadest generic to the most specific heads, no study or acquaintance with the scheme is required. The reader has only to open the simple alphabetical printed index in the back of the classification to any of the names by which the subject he seeks is known, and its number is found. All books, pamphlets, catalogues, lists, charges for books loaned, etc., are in simple numerical order, and thus are found side by side all the resources and references in the quickest and simplest manner possible.

The accuracy and simplicity of this method allow the subject number to be put on all cards, references, book plates of all volumes, and wherever they can be of service to readers. When the entire library is thus analyzed, including not only books and pamphlets but articles in periodicals, transactions of societies, volumes of essays, etc., the facilities for study by topics will be unequalled, for by no other method can such aid be so easily provided.

Charging system.—For the convenience of readers, all books are charged and returned at the entrance door only. While the system requires the least possible delay, it permanently records all the books drawn by each person, giving a complete history of his reading; also, all the readers who have drawn each book, giving a complete history of its use. Officers may borrow 20 volumes, graduates and students three volumes, at once. The register tells instantly the whereabouts of every volume off the shelves, thus allowing books specially wanted to be sent for, or reserved for any reader who wishes them on their return. By writing his address on the blank provided, a reader insures written notice as soon as the book is obtained. The system also allows books to be charged to tables in the six private reading-rooms, if a reader has enough need to warrant it; *e. g.*, he may require 10 or

15 volumes daily for a month in making some investigation. By permit these are charged to his table, which has its number and is treated as a borrower. The reader keeps his 15 volumes together on his table, avoiding all delays of getting them daily. In case any of them are wanted by others, the register shows instantly where they can be found. Readers may consult them without delay, after which they are returned to their temporary place on the private table.

For special emergencies, where a reference book is needed out of the reading-room for an hour or more, a pink ticket allows its temporary removal, so that readers may get more good from the library.

Additions.—There are now over 90,000 volumes, carefully selected as most important for the work of the college. Additions are constantly made of the best books in all departments in which the college offers instruction, special attention being given to extensive and costly works not readily accessible elsewhere. Over 500 different serials, the leading transactions of societies, periodicals, etc., in the various modern languages, are regularly received, constantly accessible in numbers, and promptly bound. With the exception of those much used in the reading-room, these unbound serials as well as pamphlets are kept with the books in the minute classification by subjects. A classed record is also kept, so that any reader may see the daily arrivals of fresh matter on the subjects he is studying without going through the entire list. All books are bought for their practical usefulness to readers, and rapid growth seems assured.

Special efforts are made to provide on the open reference shelves, for immediate use without the formality of asking, dictionaries, cyclopædias, bibliographies, indexes, compends, and all the best reference books in all departments, and in all prominent languages.

Selection of books.—On blanks provided for this use, every reader is invited to recommend for purchase any book, pamphlet, or periodical needed in his studies. Besides this there are open selection shelves for leading departments, on which, each week, are placed the latest publications on that subject. This affords an unusual opportunity to keep abreast of the weekly bibliography of each subject, and to select the most desirable books for the college as well as for private libraries.

On receipt of a book for which the blank shows some

reader to be waiting, it is marked "haste," and passes through all the processes of preparation and cataloguing with the utmost dispatch, so that the reader may have a book in an hour, which, if taken in regular course, could not have been ready for delivery in less than a week, or even longer when received as part of a very large invoice. All new books as soon as catalogued are placed on the inspection shelves in the reading-room, where they are kept one week before going to their permanent places, thus assuring every one who examines these shelves once a week that he will see every new work added to the library.

Townsend Civil War Record.—This unique and remarkable collection is now placed in the west end of the main reading-room, open to consultation at all hours on application to the History librarian.

The Record is a colossal compilation, equal to 1,000 8° volumes, of every thing that relates directly or indirectly to the civil war that appeared in the metropolitan press from 1860 to date. This, great as it is, represents only one tenth the labor, for all of it has been condensed into Journals, and all these in turn are posted into the classified Encyclopædia, which, in its turn, is indexed. From the index any topic of interest is readily found in the great Encyclopædia, which embraces about 300,000 items, and is not merely an index, but a summary, analysis, or digest, of the 250,000 columns of journalistic and magazine literature on the war. This covers not only the great events of the war, campaigns, battles, etc., but it gives a history of every regiment in the Union Army and many in the Confederate; all lists of killed, wounded, and prisoners; all about the navy, and every known ship or mariner belonging to it; privateering, blockades, the Alabama claims, secret history, captured correspondence, speeches, letters, proclamations, ecclesiastical documents—indeed, nothing has been omitted that can afford information as to the history of any individual or event connected with the rebellion. It has been called the "Domesday Book" of our rebellion history.

The value of this Civil War Record for the thorough student of any phase of the great rebellion can hardly be overestimated.

N. Y. Academy of Science library.—This library, estimated at 8,000 volumes, now occupies the sixth floor, in charge of its special librarian. It is largely composed of complete sets of the publications of learned societies in all parts of the world, and contains many valuable scientific

works not elsewhere available. It adds greatly to the value of the university collection, being open for consultation at all hours.

Aids to readers.—The library is not content merely to accumulate, safely store, carefully classify, and fully catalogue its treasures. Students and investigators, with limited time and the immense amount of material with which they must often deal, imperatively need the aid of one fully acquainted with the library's resources, able to discriminate between sources of information and adjust them to the reader's manifold needs, and always at hand to impart needed help. To find the fullest and readiest answer to his questions is the student's practical want. He is greatly helped if he can avail himself of the labor of others instead of receiving the books on his subject in a disorganized mass, which he must first arrange and criticise.

Students are supplied with the best bibliographies, cyclopædias, dictionaries, and other works of reference, and induced by example, by discriminating counsel, and by direct training, to know these books, to use them intelligently, and to acquire the habit of hunting down a needed fact or verifying a mooted point, instead of letting it pass because not readily found or verified. Indeed, the accuracy and thoroughness which find out exactly what the fact *is*, instead of assuming as true what it is reported to be, what it might be, or what it ought to be, are the central principles of the historical or critical method, and the foundation of all sound scholarship.

The best text-books, treatises, and other works are also provided as secondary sources of information, and the student is made acquainted with their character, purpose, standpoint, and authority, and guided in their use.

The reader oftenest asks: What are the best books on the subject? In what order and how shall I take them up?

It is the first duty of the reference librarians to give such help. Students working up subjects for theses, prize essays, orations, debates, etc., find this feature of the library of the greatest utility.

Still further, the library provides for its graduate students, and others making special studies, the material for original work. In the immense field of original sources of information, this can be done in many cases only by laborious and often costly gathering of books, pamphlets, reports, etc., for the immediate use of a particular person. These the library always tries to hunt up, identify, promptly procure,

and place at the disposal of those who have a right to expect such help. In the future, this can be done still more fully, so that students making special investigations may hope to have the necessary material, if it exists.

Thus the library labors side by side with the chairs of instruction in training students in the use of original sources, forming mental habits not content with second-hand information, and in developing patient skill which constructs from genuine sources of knowledge fresh combinations of facts and finds out new truths.

Library lectures.—Individual aid to readers is supplemented by general instruction and suggestions given in lectures, to which all interested are cordially invited. The course begins in January each year, and one lecture is given each Saturday at 10 A.M., the topics and speakers being bulletined a week in advance. Added lectures are given afternoons at the close of the regular college exercises. In outline this instruction embraces:

1. Books—practical bibliography proper: to teach what particular work will best answer any given need.

Without attempting antiquarian or technical instruction, much can be done to give a working knowledge of what reference books there are, their comparative merits in respect to given subjects, and how to use them to the best advantage. The average college student, not to say graduate, is ignorant of the greater part of the bibliographical apparatus which the skilled librarian has in hourly use, to enable him to answer the public's thousand queries. A little systematic instruction may so start students in right methods that, for the rest of their lives, all their work in libraries will be more quickly done and vastly more efficient. Now students often, if not usually, spend half their time in the library in finding out what they *do not* want to know, and the remaining half in getting confused notions of what they *do* want to know.

The professors in various departments have undertaken to supplement the general bibliographical lectures of the librarians by specific guidance in their respective departments, given in lectures, with representative books before them as illustrations. For fuller information as to this course see page 263.

2. Editions: to teach what edition is best to buy or consult, whenever there is a choice of editions.

In many cases, after knowing the author and work wanted, there is large room for choice in editions. This

instruction is also specially valuable as an aid in buying books, an important matter to a college-bred man. Such questions as size of type, leaded or solid composition, color and quality of paper, binding material, method of sewing, lacing in boards, head-bands, lettering, illustrations, foot-notes, indexes, and all the details which go to make up a perfect book, have been studied and worked out to valuable results which can be readily imparted to the learner. As all of literary life is based on books and reading, it is a wise investment of the little time needed to acquire so much information on these topics as is practically useful to an educated reader, though he may not follow out details valuable only to the printer, binder, or publisher.

3. Reading: to teach how to get from the book what is wanted and no more, most quickly and easily.

After choosing wisely book and edition, a still more important thing for practical training is the best method of reading. Some men, by long years of experience and practice, acquire the art of getting at the heart of a book in one fifth the time taken by most readers, and this not in a merely superficial way, but so as to have clearer ideas of the author's meaning than have those who spend the longer time. Much of this art depends on personal quickness, but enough can be imparted to the young reader to enable him to start, aided by the best methods developed in the experience of others.

4. Literary methods: to teach how to remember, record, classify, arrange, index, and in every way make most available for future use what has been gained from the books.

Finally, and perhaps most important, is the aid that may be given in readily preserving for future use the results of reading. This involves details, in the aggregate important, concerning which the needed instruction and suggestion may be given in little time. Notes, scrap-books, index rerums, card catalogues, card indexes, and the hundreds of appliances and methods proved useful by people who with them have improved their modes of working, may be made quickly familiar. As a rule, these schemes, as started by students, *break down* after a few years, and the material accumulated becomes worthless. But with proper guidance and suggestions at the first, most of them could be made successful. No one questions the importance of such record and preservation, and that failure is the rule, only emphasizes the importance of proper instruction.

We do not teach uniformly to all our students the plan any one man has found best for himself, ignoring the personal equation of each ; but simply collect, digest and lay fairly before them the results of wide experience in these directions, showing the strong and the weak points of each plan, thus enabling them to decide at the outset, and in the light of the experience of others, the many questions that, without such help, they can decide as wisely only after costly and disheartening experience of their own.

Readers' tickets.—The college library, collected for the use of officers, students, and graduates of Columbia College, is really more useful to others than many public libraries. Any unobjectionable visitor, though an entire stranger, is always received cordially and shown the rooms or books he wishes to see. If he desires to come regularly, and is properly introduced by a responsible person, he receives a reader's ticket, which admits him at all times to the main reading-room, with direct access to the reference library of 40,000 volumes. Were the shelves railed off from the reader's space, as in most libraries, the doors might be opened to all comers ; but in order to grant unusual privileges to those known to be trustworthy, the library is forced to take precautions against abuses.

Gifts.—Since the college has offered a permanent fire-proof depository in which all books are available for 14 hours daily throughout the year, gifts have constantly increased. These include many valuable works not purchasable, as owners of choice books or collections often prefer to deposit them where their safety and permanent usefulness are secured in the highest possible degree, rather than sell them at any price. To such donors are accorded special privileges, and they may introduce friends to the use not only of their own books but of the entire library.

The gift of books and pamphlets no longer needed by the present owners is solicited. Duplicates are of almost as great value as new books, since by our system of exchanges with many other libraries we are able to replace them with an equal number which we do not have.

Packages of books, pamphlets, etc., will be sent for or may be sent by freight or express, unpaid, addressed COLUMBIA COLLEGE LIBRARY, NEW YORK. It is specially requested that in sending such gifts, friends do not withhold what seems to them valueless. It is little trouble to throw out worthless material on its arrival, and it frequently happens that gifts, made with an apology for their worthless-

ness, contain matter of great value to some department in which the owner was not interested, or that odd volumes or odd numbers of serials are the very ones needed to complete imperfect sets in our own or another library.

The gift of books and pamphlets privately printed or not regularly on the market is specially solicited, for often it is quite impossible to secure such works except by gifts, and in later years there is not infrequently special demand for them when most of the edition has disappeared.

Endowment of subjects.—Similar special privileges are also granted to those who give money, the income of which is to be used for books on any special subject. Such special collections may be named by the giver, and each book so bought contains a book-plate giving its source, and if wished a separate catalogue will show together all the works bought with the special fund, and an inscription mark their place on the shelves. Endowments for subjects which the givers wish well represented in the library are cordially invited.

The trustees have recently printed an appeal to the public, pointing out their recent great effort to provide a university library of the first rank, in which every scholar living near the metropolis should take pride. They have spent over \$400,000 on a new fire-proof building, equipped it with the electric-light and with heating and ventilating apparatus, furniture and library fittings of the best known models; have furnished six reading-rooms with tables for 300 readers; employed a chief librarian with an efficient staff of four librarians and twenty assistants; opened the library 14 hours daily throughout the year, including holidays and vacations, or ten times as many hours yearly as heretofore; and have added the best books, serials, and pamphlets, much faster than ever before.

They appeal to all interested in a library of this rank, to support these efforts by gifts of money and books. Without such aid, the college cannot meet promptly as great a demand as is now placed on this new university library. Special endowments, of \$5,000 to \$50,000 each, are asked for 20 leading subjects, the income of which would provide for the yearly wants of each, so that every thing desirable could be obtained promptly on publication, and gradually the gaps in the past literature of the subjects could be filled.

Fuller information may be had on application to Melvil Dewey, chief librarian, Columbia College, N. Y.

SCHOOL OF LIBRARY ECONOMY

FOR

TRAINING LIBRARIANS AND CATALOGUERS.

ORIGIN.

On May 7, 1883 the president proposed to the Trustees of Columbia College that they should open a school for the training of librarians. The extracts below show the reasons for that proposal.

“In the past few years the work of a librarian has come to be regarded as a distinct profession, affording opportunities of usefulness in the educational field inferior to no other, and requiring superior abilities to discharge its duties well. The librarian is ceasing to be a mere jailer of the books, and is becoming an aggressive force in his community. There is a growing call for *trained* librarians animated by the modern library spirit. A rapidly increasing number of competent men and women are taking up the librarian's occupation as a life work. Thoughtful observers say that public opinion and individual motives and actions are influenced now not so much by what is uttered from the rostrum or the pulpit as by what is read; that this reading can be shaped and influenced chiefly and cheaply only through the library, and therefore that the librarian who is master of his profession is a most potent factor for good.

“In our colleges every professor and every student, in whatever department, necessarily bases most of his work on books, and is therefore largely dependent on the library.

“Recognizing the importance of this new profession and the increasing number of those who wish to enter it, we are confronted by the fact that there is absolutely nowhere any provision for instruction in either the art or science of the librarian's business. Prominent library officials tell us that it is no uncommon occurrence for young men and women of good parts, from whom the best work might fairly

be expected, to seek in vain for any opportunity to fit themselves for this work. It is simply impossible for the large libraries to give special attention to the training of help for other institutions. Each employee must devote himself to the one part of the work that falls to his share, so that he can know little of the rest, except what he may learn by accidental and partial absorption of methods. There is a constantly increasing demand for *trained* librarians and cataloguers, and there is no place where such *can* be trained. A limited number may be here and there found who have had certain experience in parts of library work, but few who have been systematically trained in any one thing, and fewer still who have had such training in all. The few really great librarians have been mainly self-made, and have obtained their eminence by literally feeling their way through long years of darkness.

"Such a school is called for, not only by the inexperienced who wish to enter upon library work, but by a growing number of those already engaged in it. Of the 5,000 public librarians in the United States, not a few would gladly embrace such an opportunity to bring themselves abreast of modern library thought and methods; and their employers would find it economy to grant the necessary leave of absence. If it be true, as is so often stated, that 10,000 volumes catalogued and administered in the best way are more practically useful than 30,000 treated in an unintelligent or inefficient manner, then it is of the greatest importance to advance by every possible means the general standard of library work throughout the country."

The trustees referred the proposition to the library committee of seven trustees, who, after a year's consideration, on May 5, 1884, reported unanimously in favor of establishing the "school for the instruction of persons desiring to qualify themselves to take charge of libraries, or for cataloguing, or other library or bibliographical work."

That report also said :

"The conditions most favorable to the usefulness of such a school are only to be found in connection with some considerable library, in which the best methods of library management as now understood are practically illustrated, and at the same time in connection with a prominent college having the facilities and experience needed in any school, and with the power to grant proper certificates, and confer, in special cases, merited degrees.

"We now have the needed library building and rooms

and the library in operation as a basis for study. The technical apparatus required for comparative study is provided by the deposit with us of the entire collection made during eight years past by the American Library Association, and added materials will be furnished by inventors or libraries using them."

The resolutions establishing the school were passed by the trustees May 5, 1884, as follows :

Resolved, That there be established, in connection with the college, a school in which instruction may be given in the principles of library management, and in which learners may qualify themselves to discharge the duties of professional librarians; such school to be called the Columbia College School of Library Economy.

Resolved, That the school established by the foregoing resolution shall be under the superintendence and control of the library committee, who shall prescribe the course of instruction to be pursued in it, fix the amount of the tuition fees to be paid by its students, and enact all necessary rules for its government, subject to the approval of the Board of Trustees.

Resolved, That the chief librarian, under the committee, and with the advice and approval of the president, shall have the general direction of the school and of the course of instruction so established, with the style and title of Professor of Library Economy.

Resolved, That the library committee be authorized to make arrangements with experienced librarians or experts whose coöperation in the conduct of the school may be desirable; and that any expenses incurred may be defrayed out of the fees received for tuition in said school.

Resolved, That instruction in the school shall commence on the first Monday of October, 1886, or at such other date as the library committee may fix.

Second year.—The experiment of the new school was tried during the past year by limiting the class to ten, and offering a course of three months in Library Economy. In response to urgent requests this limit was raised one by one, till at the opening there were twenty students to take the course. At the middle of the term the class petitioned for a fourth month. This was granted, and at its end a majority of the class had decided to take the two years' course which was then offered them, while some asked for a third year of advanced work. Experiment thus proved that there was a greater demand than had been realized, for more thorough

work and in a broader field than the school had planned for in the three months.

While the short course will practically be maintained for those who cannot do more, the school, in its second year, will extend its annual session from four to seven months of solid work, and broaden its field to include not only library economy, but a fuller course in bibliography than has before been offered. A second- and third-year course are also in active preparation.

GENERAL PLAN.

The general plan was announced in the annual circulars for 1884, '85 and '86. Details were deferred in order more fully to profit by the suggestions of experienced librarians interested, by the expression of needs from those attending the first year's session, and by the practical experience gained by experimental teaching.

In 1883, the American Library Association appointed a committee of five experienced librarians to consider this subject. The result of their conferences, of the suggestions and experiences of four years, and chiefly of the school experience for the first year, is the plan given below.

As this is the first school of the kind ever attempted, and only experiment can prove just what and how much is really needed or can wisely be attempted, it begins modestly and will make such changes hereafter as its growth and experience may clearly demand.

Students are cautioned not to expect more than the school professes to attempt, for it differs widely from most other schools both in its objects and methods.

1. It confines itself strictly to its peculiar work, and makes no attempt to give general culture or make up deficiencies of earlier education. The instruction offered in language, literature, history, science, or art, is limited to what the librarian must know to do his technical work intelligently. The allied lectures (see page 264), freely open to those who wish to attend them, afford students both recreation and instruction, but all these are incidental, not a part of the regular course. The school is not like an agricultural college, which gives a general literary and scientific course with more or less agriculture included or kept in view as a possible occupation, but offers rather a short technical course, coming after the college education, and often after its students have been for years engaged in active work.

2. Not only are the subjects studied closely limited by the end in view, but in their treatment the school methods have less of the usual text-book and recitation, and more of systematic apprenticeship in which every effort is made to advance the learner rapidly rather than to keep him an apprentice as long as possible. Its students are thoroughly in earnest, anxious to profit by every opportunity, and therefore do not need the same influences to secure effective work that are used with younger pupils.

3. Finally, instead of a single course, evenly distributed over so long a period as to debar many from attendance, the most essential instruction is condensed into a single term for the benefit of those who cannot command the time for the full course. This brief training may seem unworthy so important a profession, but heretofore many librarians have begun their duties with only the help gained by a visit of a single day or week to some well-organized institution, and others have got their new inspiration and start in a higher grade of work from attendance at a three or four days' meeting of the American Library Association. Twelve weeks of earnest work should therefore make a satisfactory beginning if nothing more is possible.

Length of course.—The full regular course is two college years, called junior and senior, each divided into three terms. A third year's course is in preparation, to include comparative literature, special work in languages, chiefly translation, and advanced studies in bibliography and library economy.

The attendance the first year was equally divided between those starting in library work, and library assistants and cataloguers who had taken leave of absence in order to attend a part of the course and thus broaden their interest and technical knowledge. The latter class cannot be long absent from their positions, and having already had experience, which largely takes the place of laboratory work, have less need for putting in practice the lessons of the school while still under the eyes of the instructors. The course has therefore been arranged so that the lectures and instruction most important for those who have already had library experience are condensed into the lecture term, January, February, and March of each year.

It is found necessary that all who have not had experience should spend at least two months in becoming familiar with a library and its manifold work from the librarian's standpoint. Otherwise much of the lectures is only partly

understood and appreciated. This preparation is given as the first term of the junior year, and includes the rudiments of library economy and bibliography, with special attention to cataloguing. The mornings are given entirely to work under the teachers, and in the afternoons not over one lecture a day guides to the best use of the time in preparing to hear profitably the coming discussions and instruction. As these two months are given to special preparation for the condensed instruction of the year, it is important that those who wish to get most good from the short course should fit for it at the school. Beginners should not enter for the lecture term only, hoping to make up for lack of preparation by extra labor, as the work for the three months is very heavy and occupies all the time of those who have prepared for it. Besides the study, instruction, and lectures, two to three years actual experience in library work is necessary for any proper qualification, and this should be secured in some well-managed library if it is not practicable to take the full course in the Columbia school. This is like the office or hospital work expected of the young lawyer or physician after he graduates from the professional school, and before he begins independent practice. But the experienced librarian or assistant attends the three months' library course as a practising physician comes to the city to attend lectures and do laboratory work under skilful instruction and supervision, and without repeating his hospital apprenticeship, returns directly to his practice, where he has his own cases to study.

Terms and hours.—The first term of the junior year begins on the Thursday in November eight weeks before the opening of the lecture term on the first Thursday in January. This continues to the opening of the apprenticeship term twelve weeks later, and the year closes on the last Wednesday in May.

To accommodate those who wish to complete the year's work in the shortest time, the three terms succeed each other without any intervening vacations, one term ending Wednesday night, and the next beginning Thursday morning, thus making the school year seven months of constant work. The library is open for work every day, except Sunday, from 8 A.M. to 10 P.M.; but there are no exercises on legal holidays, Monday forenoons, or on Saturday afternoons, these being left free for individual or outside work. Apprenticeship work may be continued after June 1st, or begun (except for the first year) before November, as the

library is open throughout the year; but no regular class exercises are held during the summer. During the lecture term the teachers give direct instruction only between 10 and 12 A.M. The three hours from 2 to 5 P.M. daily are given for the various lectures, clubs, seminars, quizzes, and examinations. Each Wednesday afternoon is given to a visit (see p. 268) for the detailed study of some library, book-house or bindery, as seen in operation.

To each student is assigned a table for his work and study, and for his books, stationery, models, etc. These private tables are available to students for individual reading, study, and library work from 8 A.M. to 10 P.M. daily, thus making private rooms for study unnecessary.

Admission.—Any person not less than twenty years of age, of good moral character, and presenting satisfactory certificates or diplomas, or satisfying the faculty by personal examination that he has sufficient natural fitness, ability and education to take the course creditably, and thereafter engage successfully in library work, may be admitted to the class. Graduates of literary colleges in good standing are admitted without examination as to scholarship. Students who are candidates for a degree will be required to make up any deficiency discovered after entrance. While a college education is important as a preparation, it is not required in all cases; many of the most successful librarians have not been college-bred, and the exaction of a degree for admission to the library school might shut out many whose work hereafter would be most creditable. The usual testimonials as to character and previous education or experience should be sent with the application.

Application for admission should be made on the blanks provided as early as practicable, as the tables and rooms assigned to students restrict the admissions. As the sole purpose of the school is the advancement of library interests and the elevation of the profession of librarianship, there will be chosen from the applicants of each year only a limited number of those who give best evidence of fitness to meet satisfactorily the demands of their chosen life work. The number of admissions to the regular class is thus closely limited; but this does not wholly shut out those who think they may profit by the lectures and exercises of the school, and do not ask it to become responsible for their attainments or to assist them to new positions.

The school aims specially to help on those who have al-

ready started in library work, and will admit special students, not candidates for positions, as far as consistent with the claims of the regular classes. In such cases little or no examination will be required, as the candidate has already entered the profession; but if he wishes later to join a regular class, he must then pass the required examinations.

In the same way admission will be readily granted to those not intending to take a library position, but interested in bibliography or library economy for personal use or as a part of a liberal education.

Years are given to the learning of music or some other accomplishment by people who assume that the science and art of librarianship are to be mastered in three months. The school is glad to give all the assistance possible in one short term to those who cannot command time for a proper course, but does not encourage the attendance of those who think they are to become expert librarians or cataloguers after three months of study, however faithful.

Tuition.—The annual fee for each student, payable on matriculation, is \$50. The same fee is required from those who take only the three months' course. The fee for all the lectures and instruction of any single month is \$20. For special instruction (see page 262) or special course of lectures the fee varies with the subject and length of course, and may be learned on application. The receipts from tuition are used to obtain extra services from librarians and experts outside the faculty, who give valuable special lectures supplementing the regular work.

Expenses.—Board and rooms may be had for \$6.00 to \$10.00 per week. There are no extras charged at the school, and really necessary incidental expenses are slight. Note-books, catalogue-cards, and incidentals, to be retained as personal property, do not exceed ten dollars a year. Five dollars more should be allowed for expenses on class excursions. Circumstances and taste must determine for each the allowance for outside and personal expenses. It is also very desirable that each student should spend a reasonable amount for important reference books and aids, most of which may be had while at the school at greatly reduced prices, conceded to our library students by publishers and manufacturers. Such expenses are wholly optional.

Prize scholarships.—To encourage the most successful students to complete a thorough preparation, one or more prize scholarships of \$100 to \$300 per year, will be awarded

to those who most successfully complete the studies of the junior year and are adjudged competent to discharge such duties as may be assigned to them as junior assistants in the college library.

Fellowship.—A fellowship of \$500 a year will be assigned to that graduate of each year who most successfully completes the two years' course and proposes to pursue a course of study for higher attainments in librarianship. The successful candidate must study under the faculty and act as an assistant in the college library.

Employment registry.—The main purpose of this school is to provide satisfactory librarians, cataloguers, and assistants for the rapidly growing number of libraries, public and private, town and college, reference and circulating, that wish help in starting anew or reorganizing with the best and cheapest methods, and in the modern library spirit. Many assistants have already been sent out from the preliminary classes to fill such vacancies before they had opportunity for full training. A registry is kept of all students wishing positions, with notes of their qualifications, experience, salary required, and position or kind of work and section of country preferred. The school undertakes, for any library or individual wishing such services, to recommend the student who seems best adapted to the work required. In this way the most satisfactory assistant can be secured for a given salary. Every student is entitled to free registration and to such recommendations for vacant positions as his abilities and work while in school, or elsewhere, have merited. No promise of position or salary is made, but past experience indicates that there will be applications each year for more than the ten students who can at present be instructed in each class.

Those who wish fuller information as to natural qualifications essential to success, and the opening which librarianship now offers, are recommended to read the address on Librarianship as a Profession, before the Association of Collegiate Alumnae, March, 1886, which candidates may obtain at the college library.

Certificates.—Each student receives on leaving the school a certificate of the subjects studied, the time spent, the character of the work done, and the success with which the various examinations have been passed, with such added commendation as may be merited in each case.

Partial courses.—To provide for those whose limited time will not allow a full course, but who wish instruction

on special subjects, the study is largely by topics, so that one need attend only while the school is engaged on the subject in which he is interested, *e. g.*, a private book-owner may attend the lectures on cataloguing, binding, and buying, without studying the details of the management of public or circulating libraries, in which he may have no immediate interest. A moderate fee is required from those who take a partial course.

Special instruction.—In preceding years not a few young librarians or cataloguers have spent a short time in the college library in preparation for work elsewhere. Now that the staff gives so much of its time each year to the instruction of a class, it is no longer consistent with the claims of our own library to allow the pressing duties of the rest of the year to be interrupted by individuals who wish assistance but do not avail themselves of the liberal opportunities offered by the school. Many requests have been received for permission to come during vacation or for periods from a few days to a few weeks. In such cases from one to four hours each day of the time of a librarian or senior assistant is usually given to the inquirer to the very serious detriment of our own work. The total fees received for tuition are used in securing outside instruction and for a small part of the incidental expenses incurred wholly for the class. The library staff therefore receives nothing for the instruction of the year, and cannot in addition allow its proper work to be further interrupted. Those wishing special instruction outside the school terms or hours must arrange for it as a matter of private tutoring, and the library will extend the same privilege that it accords to those wishing investigations made at their expense (see p. 241), *i. e.*, the time of a cataloguer or teacher may be had for personal assistance or instruction by paying the *pro rata* salary of that person for the number of hours occupied.

Extra studies.—Opportunities are so great for study and investigation in other subjects that any available time can be used to the best advantage. Library students can utilize their university residence for special studies, and students in the various other schools can elect parts of the library course, but students taking the full course with the daily training in the Library School will find little or no time for outside work. Those who take the lectures without the training or take only a partial course will find the widest opportunities for study and general culture.

Circulars of information, sent on application, give the

courses of instruction and lectures in the Graduate Department and in the Schools of Arts, Mines, Law, and Political Science. Arrangements can be made by male students who wish to attend special courses, without being candidates for a degree, in any of the schools except the School of Mines. The circular of the last-named school contains descriptions of the extensive and carefully selected museums and collections which are open for the inspection of students. The famous Torrey Herbarium, including the Torrey, Meisner-Crooke, Chapman, and Austen collections, is arranged with the botanical library on the sixth floor of the library building.

The circular of the Collegiate Course for Women gives the terms on which all the college degrees are open to women who pass the required examinations, without having received their instruction in Columbia College.

LECTURES.

By lectures interest is developed, needed inspiration given, and information not otherwise accessible imparted. As their purpose is to give the greatest help to the students, some of them are conferences or conversations rather than formal addresses. Often the men whose experience and advice are most valuable are too crowded with other duties to give time to rhetorical finish and students are often more profited by an informal presentation. This feature of the school is divided into six groups. 1. Course in library economy. 2. Course in bibliography. 3. Course in literature. 4. Extra lectures by specialists. 5. Extra lectures by leading librarians. 6. College lectures.

1. Course in library economy.—The regular lectures in the systematic scheme of instruction, treating each day the subject then before the school for study, (for topics see pp. 272–275), are given by the faculty as the basis of the notes, quizzes, reviews, and examinations.

2. Course in bibliography.—This course is introduced by general discussions of the scope and utility of bibliography, after which the entire field is covered, at least in summary. Professors and other specialists in the various schools of the college, representing nearly all departments, lecture on the bibliography of their respective subjects. With a collection of the books referred to before him, and often with a check list of titles, printed or duplicated in advance, in the hands of each student, as an outline for notes,

the professor states those things which the librarian most needs to know in regard to his department, *e. g.*, the leading societies and associations, indicating the comparative rank and value of their publications, and the phase of the subject to which each gives most attention, and showing sample volumes in illustration. In the same way he summarizes the value of the periodicals and of the leading authors and works, indicating the best popular treatises for general readers, and the best exhaustive work for thorough study. In the languages, as part of the course in literature (see next paragraph), the professor adds to the above short comments on the leading poets, novelists, and other authors, noting the best editions, the best translations, the best histories of the literature, and the books which a librarian could most wisely recommend to one reading with a view to acquire or keep up a language. In short, the lectures are to teach the librarian how to answer wisely the questions he is likely to be asked in various departments. Avoiding what interests only the specialist, and making prominent what the librarian needs to know, a valuable general view of all the leading departments is given by recognized authorities.

3. Course in literature.—This is closely allied and will include the bibliography of the various literatures discussed. So large a part of the reading in most libraries is in the field of belles-lettres that a course of over forty lectures by the college professors and other eminent scholars has been arranged for the class as a comprehensive and comparative view of the leading literatures of the world, thus giving an excellent basis for the work which every successful librarian must do in general literature. The course will meet the special wants of the librarian rather than those of the ordinary student.

4. Lectures by specialists.—Outside the regular course of instruction by the faculty, lecturers who have made special studies, and are qualified to speak with authority, supplement the discussion of their topics. Inventors or leading advocates of various systems and theories in library science are thus heard in support of their own ideas. This course includes lectures or conferences by experienced binders, printers, publishers, booksellers, and others, who, from allied interests, have something to impart of special value to librarians.

5. Advice from leading librarians.—A series of lectures, independent of the course of instruction, and embodying

whatever each thinks most helpful as his message to beginners, is given by a select list of those who have had the longest or most fruitful experience in the profession. These enable students to make the personal acquaintance of eminent librarians, and to hear from their own lips what they esteem the most helpful advice and suggestions. Each lecturer uses entire freedom in the choice of topics and in the manner of treatment, thus securing unusual freshness and variety.

6. College lectures.—Besides the five courses above, directly connected with the school, there are open to the students, without charge, a large number of interesting and valuable lectures, conferences, and meetings covering a wide range of topics in science, literature, and art. These are largely delivered before the various literary and scientific societies which meet at Columbia College, *e. g.*, the New York Academy of Science, New York Shakspeare Society, Chemical Society, Engineering Society, Torrey Botanical Club, Children's Library Association, New York Library Club, Academy of Political Science, and other bodies. These lectures are often by eminent specialists from other colleges, and while not delivered as part of the school work, many are specially adapted to the librarian's needs. The college maintains also an interesting course of public lectures given each Saturday at 11.30 A.M. in the large lecture-room of the library building.

OTHER METHODS OF INSTRUCTION.

Practical training rather than mere information is the end sought, and any method that promises to make more efficient librarians is tried.

As mere lectures and text-books, however good, will not give the best preparation for the lawyer without practice in office work, moot courts, and observations of the methods of the ablest members of the bar; nor the best training to the physician without clinics and experience in the hospitals; and as no good working chemist was ever made without the laboratory, so lectures and reading alone will not achieve the best results in training librarians, without the seminars, problems, study of various libraries in successful operation, and chiefly actual work in a library. The school therefore uses all these methods in such proportion as experience proves will give the best results.

Reading.—Students are directed to matter to be read in

connection with their studies and practice, and to other collateral matter to be read later, if time does not allow during the course. Critical estimates of the books, pamphlets, and articles are given, with cautions where allowance must be made for the peculiar circumstances or prejudices of the writers. The reading is followed by reports, summaries, or examination.

To make this important department more effective, the school has collected a special library on the subjects of study, and liberal selections from it will be kept in the classroom for more ready consultation. To this it constantly adds all publications of value, and also provides of the more important works duplicates for home use, so that students may be sure of opportunity of reading the most desirable matter without the expense and delay of getting for themselves books costly or difficult to find.

Seminars.—These conferences bring together teachers and students for frequent and familiar discussion of the subjects before the school. Short original papers, summaries of books and articles read, new theories or strictures on old ones, reports on libraries visited and on their methods, discussion of difficulties in the daily work, and withal the greatest freedom of inquiry and criticism, make these seminars of the greatest interest and practical utility.

The Library Literary Club, made up of members of the staff, meets semi-monthly for mutual improvement. Papers, discussions, reports of books and articles read and found to be worth the attention of the club, coöperative study, various members undertaking to investigate and report, each on some part, and similar exercises, afford excellent opportunity for training and growth. In these club meetings students have an active part, being treated as if regularly on the staff, in the privileges of which they share. Similar opportunities are given by the New York Library Club, which meets regularly at the Columbia College library. See page 265. For the clubs organized among the students themselves for coöperative study, rooms are provided and every facility for profitable work afforded if the faculty approve the organization's objects and methods.

Problems.—This method, closely connected with the seminar, tests the students' proficiency and cultivates self-reliance. After each topic is studied, students are given problems taken from actual experience, the solution of which requires thorough knowledge of the subject. Wherever the purpose can be better served, problems are specially devised.

In the senior year these subjects include a large portion of the topics treated in the school; *e. g.*, a student is given notes such as might be prepared by a competent library trustee and sent to a newly elected librarian who had no knowledge of the peculiar circumstances of the institution over which he was to preside. Such notes include size of town, character of inhabitants, extent of manufacturing or other special elements, etc., other libraries or reading-rooms, amount of property and annual income, nature of governing board, tenure of office, number of volumes, annual increase heretofore, number and exact state of catalogues and indexes, regulations in force, system of issuing and charging books, selecting, buying, binding, etc. With such data the student after study of the case comes before the class, prepared to defend his decisions against the criticisms of his associates, and states what he would do to improve this library of which he in imagination is just taking charge. This involves not only the question what plan for each item is best in the abstract, but the more difficult test of judgment, what is wisest considering what has already been done? Will changes to the ideally better plan be worth what they will cost? Or shall the old plan be continued? Or can something be devised between these two that will combine the advantages and avoid the disadvantages of both?

These practical problems include difficulties liable to be met in all departments; cataloguing, indexing, aids to readers, hunting down hard questions by skilful use of bibliographical apparatus, etc. Practically the novice thus faces in advance many puzzling questions of after experience, and learns the true solution without the mortification and expense of mistakes in real administration.

As problems can be made to fit any requirements, the variety available is limitless, and the careful solution, discussion, and final criticism and suggestions by the teachers serve the same purpose as a moot court for a student of law. This repeated study of definite cases gives that self-reliance, without which many able men fail in new undertakings, from an unwillingness to trust their own powers.

Library language lessons.—This course is designed to give in a short time such knowledge of the leading foreign languages as is most essential to the librarian and cataloguer. Those who are already familiar with these tongues are greatly helped by this course under an experienced cataloguer, for the study is devoted to the special vocabulary

of bibliography. A special feature is made of comparative tables and charts giving in parallel columns the common bibliographical words in English, German, French, Italian, Spanish, and Latin.

Those who have not studied the leading languages are required to acquaint themselves with the elements, but no effort is made to give general linguistic or literary training as a part of the library course, though it is greatly desired that students shall elsewhere acquire it.

Visiting libraries.—This, both individually and in classes, is a regular feature of the school. Before each visit the class is told what points to note as peculiar to the library or better studied there than elsewhere, and sets of reports, catalogues, etc., are provided so that students can by reading prepare themselves to gain more from the visit, and some are appointed specially to observe and report on specific subjects. Attention is given to the plans of the building, furniture, fittings, and technical appliances of all kinds, to the catalogues, arrangement of books on shelves, system of classification, book numbers, methods of calling for and charging books, etc.; and students are taught how to get most quickly and systematically from other libraries the lessons they have to teach. In the next day's quiz students report the last visit, with criticisms. After the others who have visited the same library have been heard, the teacher supplies the points, pro and con, which the students have not noted. In this way not only is practical knowledge of great value gained, but the class learns how to get most good from such opportunities in after experience. The many libraries in New York and vicinity, open for such visits, afford a large field for this comparative study.

Visiting book-houses.—With similar preparation and subsequent examination, there are visits under guidance to representative houses, where can be learned to the best advantage so much as a librarian needs to know about publishing, printing, binding, illustrating, book-selling, book-auctions, second-hand book-stores, and the many things allied to the work of the librarian, for the study of which the metropolis affords unequalled advantages.

Library work.—However excellent may be the results, from the lectures, instruction, seminars, problems, and visits, the main reliance must be on experience. As time is so important, the school aims to condense into a limited course as much experience as is possible without confusing the minds of the learners with too great variety.

Provision has been made to give each student daily work, carefully supervised by trained teachers, and supplementing the instruction and lectures. Those taking the full course thus get some actual experience in all the varied duties of a great library.

Here as elsewhere the student, as far as practicable, carries away tangible results of his work; *e. g.*, in practising the rules for cataloguing he prepares a card catalogue of select works on bibliography and library economy. These cards, corrected by the teachers, are the student's property, of double value as a list of books in his own field, and as illustrating the errors he has made and against which he needs specially to guard.

To the more advanced is given work including many difficulties. Librarians are invited to send to the school, for such practice, cases that are specially misleading. To deal in a few weeks with as many such cases as arise in several years of actual work, concentrates experience and acts as a safeguard to the young librarian.

For practice in the use of reference books and bibliographies, problems will be frequently given out, and literary papers, receiving questions suitable for such practice, offer them to the school. After the student has hunted down and prepared the answer, the teacher will point out how and where fuller or more reliable information may be found, or the same result obtained with less labor.

At the close of the lecture term, about April 1st, those who remain for the full course are at once assigned to some department of library work, under a teacher's supervision. The class meets daily for conference, answering questions of general interest and to solve the difficulties that can be treated so better than individually. The courses of reading, seminars, problems, individual visits to other libraries, and other school features are kept up, but at longer intervals and more in the control of the students themselves.

The main feature of the year's training is the laboratory, *i. e.*, actual library work, under direct supervision, with changes from one department to another, to give a general experience of each of the thirty or forty divisions of the work of a great library, instead of being limited to a single department, as in libraries where each person must be kept at work on the one thing he has learned to do quickly and well. All this work is planned in the interest of the students, not only by changing the kind of work as fast as the essential points are fairly mastered, but by giving more of

that special experience which each student needs or prefers in view of his probable work after leaving the school. One going to a popular circulating library works longer in the loan department and on the more popular books, while another, wishing a position as cataloguer in a reference or college library, prefers a larger experience in exact cataloguing, classifying, and in handling the best scholarly bibliographies.

Four hours' work a day is required, the remaining four hours being used for personal reading and study, or for additional work under supervision, as each student elects. From those who have taken the three months' course no further fee is required for the apprenticeship term, as the half day's services are accepted as an equivalent for instruction given.

Object teaching.—Throughout the course object teaching is made prominent wherever possible.

Every book, blank, or other article referred to in the lecture is, if practicable, on the tables for inspection, and extra sheets of blanks, forms, blank-books, etc., enable each student not only to see, but also to have a sample to attach to his notes of the use, merits, faults, and modifications desirable for various special uses. Inventors, manufacturers, and friends of the school have liberally provided for similar gifts of many technical articles—*e. g.*, shelf-support pins, card catalogue guides, book-braces, shelf-label holders, etc., etc., of which no description or notes can be as clear or useful as a sample.

Each subject is summed up in concise, explicit rules or directions, embodying the best results of the preceding discussion.

After explaining the necessity and uses of the shelf list in its various forms, with reference to discussions in the *Library Journal* and other sources, a model form in an actual sheet, with sample entries filled in, is given each student, showing paper, size, rulings, punching, and headings, and accompanied by explicit rules for entry of all kinds of books, pamphlets, periodicals, maps, etc. The different forms of binders, cases, or books for the shelf sheets are shown, their practical working described, and their merits and faults for various uses pointed out.

In discussing the card catalogue each student is given a series of model cards filled out in the most approved form both on the card cataloguing machines and in the standard "library hand" writing, and illustrating the many rules, with

foot-notes and references wherever the point can thus be made plainer. The rules themselves are given separately, so far as differing for various kinds of catalogues, so that the novice may not be compelled to study out how much of each rule may apply to the special style of catalogue he is making.

In discussing buying, with warnings and suggestions how to get most for the money, are given various tables to show net cost to the library of books at the usual price per franc, mark, shilling, etc., after adding commissions, fees, freight, insurance, duties, brokerage, etc.; tables of various discounts, by which bills may be checked up more accurately and rapidly, and specimen sheets of journal, ledger and auxiliary books, with directions for library book-keeping on improved and simplified plans. An introductory course on library accounts is provided as part of the executive training.

When an article too large or costly to be given as a sample is described, its size, best material, maker, cost, etc., are given, with an engraving to accompany the notes wherever desirable and possible, the purpose being to omit nothing that the inexperienced may need to know in order to get the most practical good from these suggestions.

Black-boards are freely used, and the more valuable illustrations, tables, diagrams, and book lists are printed or duplicated so as to supply each student with authentic copies for his notes.

During and at the close of each lecture opportunity is given for questions, and a box for anonymous queries and notes is always available for those preferring to ask information or make suggestions in this way.

Study by topics.—When any subject is under consideration all these methods are used in its study—*e. g.*, the accession book is treated in a lecture pointing out its importance, illustrating its various uses, and explaining the best forms. Reference is made to articles worth reading; in the seminars and club meetings there is discussion on this topic; in the problem class, various peculiar cases connected with the accession department are given out for solution; in the workroom or laboratory the practice under supervision is in writing up a model accession book; and in visiting other libraries attention is given specially to this feature. By thus approaching each subject on all sides at once, it is more quickly and thoroughly mastered.

Comparative study.—While the methods, fittings, furniture, and technical appliances and supplies adopted for the

Columbia library have been selected with great care and having constantly in mind the needs of the school, it is not proposed to teach simply these methods and ideas, nor those of any individual or class of libraries or librarians. Indeed, in many cases different parts of the Columbia library have been equipped, arranged, or treated each in an approved form different from the others, in order to give a better basis for thorough comparative study of leading methods. Library science is interpreted in its broadest sense, as including all the special training needed to select, buy, arrange, catalogue, index, and administer any library in the best and most economical way. Students have fairly placed before them all methods approved in successful administration, and are taught to select or combine from the various plans what is best adapted to any circumstances in which they may be placed. While the great advantages of specific directions are retained by giving what the teacher in each case esteems best, the different opinions held by others entitled to be heard are carefully noted and discussed and prominent advocates of different systems present their claims in person.

SUBJECTS OF STUDY.

The three months' course includes nothing of the antiquarian or historical except where necessary to illustrate or enforce modern methods. Its aim is entirely practical; to give the best obtainable advice, with specific suggestions on each of the hundreds of questions that rise from the time a library is decided to be desirable till it is in perfect working order, including its administration.

An outline of the topics to be treated with more or less fulness, according to their comparative practical importance, is given below.

Library economy.

Discussion of the general field, the object and plans of the school, and of library periodicals, associations, education, and training.

Scope and usefulness of libraries.

The library as an educator, the people's university; the library in relation to schools and the young; library lectures, museums, galleries, etc.; the library as a public recreation.

Founding and extension of libraries.

Developing interest by press, lectures, school, pulpit, societies, circulars, etc.; legislation, state and local; raising funds; securing gifts of books, etc., by subscriptions, bequests, lectures, fairs, membership fees, taxes, government aid (remitted duties, public documents, foreign exchanges, copyrights, etc.).

Buildings.

Location, provision for growth, branches, deliveries; materials and protection against fire, library fires; plans, number, size, and arrangement of rooms; storage rooms, stack, gallery, and alcove systems; reading-rooms for adults and for children, central hall *vs.* small study rooms; administration and special rooms, cataloguing, office, patent, newspaper, public document, duplicate, class, lecture, museum, art, chess, conversation, waiting, coat, toilet, etc., rooms; lighting, natural and artificial, electric, gas, etc.; heating and ventilation; fixtures, furniture and fittings, shelving, counters, hoists, desks, tables, chairs, etc.

Government and service.

Constitution and by-laws for managers; appointment and tenure of officers; qualification and duties of trustees, committees, directors, chief librarian, staff, assistants, cataloguers, janitor; daily hours, vacations, titles and duties, salaries, rules for staff.

Regulations for readers.

Readers' qualifications, age, residence, guaranties, references, registration; fees and assessments or free use; hours of opening, evening opening; Sunday, holiday, vacation, and examination closing; reference use, access to catalogues, librarians, and shelves; reading-room rules, decorum in library; home use, number of books, time, delinquencies, fines, re-lending, restrictions, renewals; special privileges to readers, extra books, extra time, reservations, suspension of rules, excuses; injuries, defacements, mutilations, losses, thefts.

Administration Departments.

EXECUTIVE.—General supervision; selecting and buying books, prices, discounts, importation, auctions, old

book lists; supplies, printing, finances, salaries, accounts; relations to readers, permits, privileges, visitors; statistics, reports, correspondence, bulletins.

ACCESSION.—Books, serials, pamphlets, ephemera; order system, slips, index, and book, order and serial blanks; reception, checking bills, collation, plating and pocketing, embossing, private marking, accessioning or entering.

CATALOGUE.—Printed, manuscript, card; author, title, subject; classed, dictionary or combined; coöperative rules, size notation; duplicated, printed, or photographed titles; cards, cases, and fittings, blocks, guards, guides, locks, etc.

SHELF.—Classification; shelf numbers, shelf and book labels; fixed and relative locations; sizes on shelves; arrangement and preservation of public documents, pamphlets, papers, manuscripts, maps, drawings, plans, music, broadsides, clippings; injuries, heat, gas, insects; stock taking; shelf lists.

REFERENCE.—Reference books; aids to readers, explanation of catalogues and methods, assistance in difficulties, advice as to best authorities, etc.

LOAN.—Accounts with books and with readers; indicators; charging systems, ledgers, *vs.* cards; book cards, marks, pockets; call slips, readers' cards; notices, reserves, fines, registers; inter-library loans.

BINDING AND REPAIR.—Materials, sewing, color, lettering; paper covers, library bindery *vs.* contract work.

DUPLICATE.—Sale and exchange.

BUILDING.—Care, cleaning, and safety; janitor; police. (The erection of buildings has separate treatment.)

Libraries on special subjects.

Law, medicine, theology, art, music, science, etc.

General libraries.

Private and family; proprietary, society, club, athenæum, and mercantile—*i. e.*, membership required; subscription, circulating—*i. e.*, conducted as business, fee required (*e. g.*, Mudie's, etc.); free public, rate supported, endowed, state and government; for special classes (prison, reformatory, asylum, monastic, workmen's, factory, railroad, sailors', lighthouse, itinerating, etc.); college; school, Sunday-school, parish; free news rooms and reading-rooms.

Libraries of special countries or sections.

Reading and aids.

Methods of reading, choice of editions, courses, fiction, reading of the young, professorships, use of reference books, aids, guides, library lectures, consulting librarians, etc. (Discussed also under reference department.)

Literary methods.

Preserving and making available the results of thought, study, and reading; index rerums, note-books, scrap-books, clippings, classification, indexing, alphabetizing; writing, materials, abbreviation, short-hand, brief long-hand, type-writers; mnemonics, labor-saving tools and methods, use of colors, standard sizes; preparing matter for the press, copy and proof, etc.

Bibliography.

Discussion of the field and utility of bibliography and of its general periodicals, societies, history, etc., followed by lectures on the various kinds of bibliographies and the leading examples of each kind; general bibliographies, universal catalogues; bibliographies of special authors—*e. g.*, Shakespeare, Goethe, Dante, Chaucer, Ruskin, etc.; bibliography of special classes—*e. g.*, books written by Jesuits, by Catholics, by members of the French Academy, etc.; of special forms—pseudonyms, books published anonymously, etc.; of special countries—books published in the country, publishers' lists, etc., giving a comprehensive view of the bibliography of each of the leading nations; of special subjects—this head includes the entire series of bibliographical lectures by college professors, each treating his own specialty. These will be supplemented by other lectures, so that the whole field will be covered, at least in summary.

Catalogues of general collections.

Systematic or logical subject catalogues, author catalogues of public and private libraries, booksellers, old books, auctions, etc.; dictionary catalogues, alphabetico-classed, etc.

Fuller details of the course, teachers, subjects, and other matters pertaining to the School of Library Economy will be

printed before the opening of the lecture term, and can be had from the director, Melvil Dewey, chief librarian, Columbia College, New York.

LOCATION OF THE SCHOOL.

New York has obvious and great advantages for such a school. The experience of the world agrees that in no other place than in the metropolis of the country can a few months be so profitably spent by either the graduate just out of college or the older professional man who has been for years at a distance from metropolitan privileges or possibly has never enjoyed them. The three months chosen for the short course, New Year's to April 1st, are those in which New York offers the best lectures, concerts, operas, exhibitions, and the greatest attractions of all kinds. The college being in the centre of the city, students have the best of opportunities to profit by the manifold means of culture outside the regular work of the school.

Directly connected with that work, we find in no other place so large a variety of libraries to be visited and studied in their actual workings, or so good facilities for studying printing, binding, publishing, bookselling, book auctions, and all those matters allied to the librarian's work, of which practical knowledge can here be quickly acquired, that will be found valuable in after life; *e. g.*, the Grolier Club, composed of leading book lovers, gives a series of lectures and exhibitions of printing, binding, etchings, etc., which can hardly be duplicated elsewhere, and the club kindly sends tickets for the library class. All the business establishments consulted have shown a cordial willingness to give the school every facility for studying these practical departments.

The New York Library Club, made up of seventy librarians of New York and vicinity, meets regularly in the Columbia College library. Its object is, "by consultation and coöperation, to increase the usefulness and promote the interests of the libraries of New York and vicinity"; its discussions are very interesting and profitable, and to all its meetings, our students are cordially invited. The coöperation resulting among the many libraries in this vicinity adds greatly to the ease and value of the comparative studies made by the school, for special pains are taken to give the students broad views of library management, to keep out of the ruts and to avoid following the exact

methods of any one library instead of choosing from a large number the best for each purpose.

The Children's Library Association also holds its business meetings at the Columbia library. The class find them interesting and profitable, and several students have volunteered to assist in its library and reading-room work. Its object, as shown by its constitution, is "to create and foster among children too young to be admitted to the public libraries, a taste for wholesome reading. To this end, it will secure the delivery of addresses, the publication of articles, the circulation of printed matter, the coöperation of schools, teachers, and parents; and chiefly, so far as its means will allow, it will supply the children, for use both at home and in free libraries and reading rooms, with the books and serials best adapted to profit them and to prepare them for the wisest use of the public libraries."

The American Library Association has formally deposited its entire collection of library catalogues, reports, appliances, blanks, and models, illustrating library methods, fittings, and supplies, and for four years this collection has been increased specially for the use of the school and is now kept in the class room.

Care has also been taken to show by actual use, in different departments or rooms of the Columbia College library, a variety of the best methods and devices, so that students may have unequalled opportunity for comparative study in one building, where they can both observe and actually test their value.

The school has the great advantage of being connected with a leading university and sharing in its privileges. Beside the libraries, reading-rooms, museums, and famous scientific collections connected with the college, the students have free access to a large number of popular lectures and meetings of societies and associations held in the various college buildings. These are at once very attractive and profitable to the future librarian, who, more than almost any one else, is likely to have use for all available information on every topic.

The Columbia College library itself has the advantage of having been entirely reorganized since 1883, thus giving opportunity for the adoption of the latest and best methods, fittings, and appliances in every department. The trustees have spent over \$400,000 on the building and its equipment, and it is believed that no other offers so many advantages as a location for a library school. The long hours of open-

ing, the large staff employed, the liberal spirit in which it is administered, and the rapidity with which the collection is now being increased, all add to its value as a basis for study.

COURSE RECOMMENDED.

We recommend as a preparation for the library profession :

1. The regular college course as a foundation.

2. The two years' course of lectures, reading, problems, seminars, object teaching, and visits, with the actual experience in doing the various kinds of work necessary in every considerable library. This apprenticeship gives a practical appreciation of the real nature of the work not to be obtained by any amount of reading, lectures, or observation.

3. Experience. The faithful student who has in this way spent two years in training should then be ready to *begin* a successful career in the library profession. With such a start he will add almost daily some new experience that will increase his value. While having very great advantages over those without a technical education, the graduates of this library school are no more prepared to take their places at once on a par with librarians of long experience, than the recent graduate of a medical or law school is prepared at once to undertake the great cases or difficulties of his chosen profession. As a rule, the young librarian may wisely follow the example of the young lawyer and secure the position of an assistant to an older member of recognized standing in his profession. But these two years given to study should enable a promising candidate, after having taken this subordinate position, to grow to something higher with a rapidity and certainty not to be expected from one who had not had these unusual opportunities for laying a deep and broad foundation, and for acquiring the inspiration and momentum essential to the most successful start in one's chosen life work. Those who cannot take the regular course, but yet wish to share in the advantages of the school, should choose as most important the junior lecture term, January to March of each year, provided they have already had experience in a library, otherwise they must take also the preparatory term in November and December in order to profit by the lectures. In these three months may be gained a general view of the whole field, so that the student shall have as clear an idea of the work to

be done and as good a start in the way of doing it for himself as can be given in so limited a time, if he is unable to continue longer under instruction. No shorter course is practicable except to select special lectures or instruction as a partial course. Those who can command only three months in each year would doubtless get most good by taking the three months' course of lectures again, in review. From this second course the student should get as much good as from the first, because in almost every part of it he will see a new and larger meaning, and appropriate what will be practically most valuable in his particular case, as he could not before he had been through his year's practical experience in the various departments of library work.

CALENDAR

SCHOOL OF LIBRARY ECONOMY.

- 1887.—Nov. 9.—Examinations for admission, Wednesday.
Nov. 10.—Preparatory term begins, Thursday.
Nov. —Thanksgiving day, holiday.
Dec. 26.—Christmas holiday, Monday.
- 1888.—Jan. 4.—Preparatory term ends, Wednesday.
Jan. 5.—Lecture term begins, Thursday.
Feb. 15.—Ash Wednesday, holiday.
Feb. 22.—Washington's birthday, holiday.
Mar. 28.—Lecture term ends, Wednesday.
Mar. 29.—Apprenticeship term begins, Thursday.
Mar. 30.—Good Friday, holiday.
April 2.—Easter Monday, holiday.
May 30.—Decoration day, holiday.
June 6.—Class exercises end, Wednesday.
June 13.—College Commencement, Wednesday.

GENERAL NOTE.

The School of Arts, the School of Mines, the School of Law, the School of Political Science, and the School of Library Economy occupy the block bounded by Forty-ninth and Fiftieth streets, Madison and Fourth avenues, within easy distance of the Grand Central railroad depot, and convenient, also, to several lines of city travel, including the elevated railways on Third and Sixth avenues. The School of Medicine, at Fifty-ninth street and Tenth avenue, is accessible from all parts of the city by car routes.

The incidental advantages accruing to the students of a college situated in a great city are well stated by the Rev. Dr. Newman in the following extract from his "Rise and Progress of Universities."

"In every great country, the metropolis itself becomes a sort of necessary University, whether we will or no. As the chief city is the seat of the court, of high society, of politics, and of law, so as a matter of course is it the seat of letters also; and at this time, for a long term of years, London and Paris are in fact and in operation Universities, though in Paris its famous University is no more, and in London a University scarcely exists except as a board of administration. The newspapers, magazines, reviews, journals, and periodicals of all kinds, the publishing trade, the libraries, museums, and academies there found, the learned and scientific societies, necessarily invest it with the functions of a University; and that atmosphere of intellect which in a former age hung over Oxford or Bologna or Salamanca has, with the change of times, moved away to the centre of civil government. Thither come up youths from all parts of the country, the students of law, medicine, and the fine arts, and the *employés* and *attachés* of literature. . . . You cannot have the best of every kind everywhere; you must go to some great city or emporium for it. There you have all the choicest productions of nature and art all together, which you find each in its own

separate place elsewhere. All the riches of the land, and of the earth, are carried up thither; there are the best markets, and there the best workmen. It is the centre of trade, the supreme court of fashion, the umpire of rival talents, and the standard of things rare and precious. It is the place for seeing galleries of first-rate pictures, and for hearing wonderful voices and performers of transcendent skill. It is the place for great preachers, great orators, great nobles, great statesmen. In the nature of things greatness and unity go together; excellence implies a centre. And such, for the third or fourth time, is a University." ("Historical Sketches," Part I., "Rise and Progress of Universities." By John Henry Newman. London, 1872.)

Board, including room rent, fire and light, and washing, may be had in the city for six and a half to ten dollars per week. The cost of living may, indeed, be reduced below this—there are students now in the college who live respectably upon a weekly expenditure of less than six dollars. It is impossible to fix a limit to the sum which a student *may* expend, if permitted to do so by his responsible guardian, but a summary of the necessary expenses, compiled from actual experience of students, shows that on an average of the whole expenses a student may, without availing himself of provisions with regard to free tuition or being indebted to the college in any way, attend the whole course and graduate at a total weekly expenditure during each scholastic year, of about \$13 in the Schools of Arts; \$17 in the School of Mines; \$12 in the School of Law; \$13 in the School of Political Science; \$15 in the School of Medicine.

Erratum.—On pp. 157, 158, it is stated that, in the Law School, "The fee for degree is \$25." This should read—The fee for *final examination for degree* is \$25.

GENERAL CALENDAR.

- 1887—Sept. 26.—Examinations for admission, School of Arts, begin Monday.
- Sept. 27.—Examinations for admission, School of Mines, begin Tuesday.
- Oct. 1.—Matriculation Day, Graduate Department and School of Political Science, Saturday.
- Oct. 1.—Examination for admission, School of Law, Saturday.
- Oct. 3.—Scholastic year begins Monday.
- Nov. 8.—Election Day (holiday).
- Nov. —.—Thanksgiving Day (holiday).
- Dec. 26.—Christmas recess begins Monday.
- 1888—Jan. 7.—Christmas recess ends Saturday.
- Jan. 30.—Intermediate examinations, School of Arts and School of Mines, begin Monday.
- Feb. 8.—First term ends Wednesday.
- Feb. 9.—Second term begins Thursday.
- Feb. 15.—Ash Wednesday (holiday).
- Feb. 22.—Washington's Birthday (holiday).
- March 30.—Good Friday (holiday).
- April 2.—Easter Monday (holiday).
- May —.—Examination for degrees, School of Medicine.
- May —.—Commencement, School of Medicine.
- May 21.—Concluding examinations, School of Arts, School of Mines, and School of Political Science, begin Monday.
- June 4.—Examinations for admission, School of Arts, begin Monday.
- June 8.—Examinations for admission, School of Mines, begin Friday.
- June 13.—Commencement, Wednesday.





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